NASA SP-7011 (71)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY

WITH INDEXES

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

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A CONTINUING BIBLIOGRAPHY WITH INDEXES

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA Information System during December, 1969.

Scientific and Technical Information Division
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
WASHINGTON, D.C. JANUARY 1970

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INTRODUCTION

Aerospace Medicine and Biology is a continuing bibliography which, by means of periodic supplements, serves as a current abstracting and announcement medium for references on this subject. The publication is compiled through the cooperative efforts of the American Institute of Aeronautics and Astronautics (AIAA) and NASA Scientific and Technical Information Facility. It assembles, within the covers of a single bibliographic announcement, groups of references that were formerly announced in separate journals, and provides a convenient compilation for medical and biological scientists. Additional background details for this publication can be found in the first issue, NASA SP-7011, which was published in July, 1964. Supplements are identified by the same number followed by two additional digits in parentheses.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the earth's atmosphere or in interplanetary space. References describing similar effects on biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis will be placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

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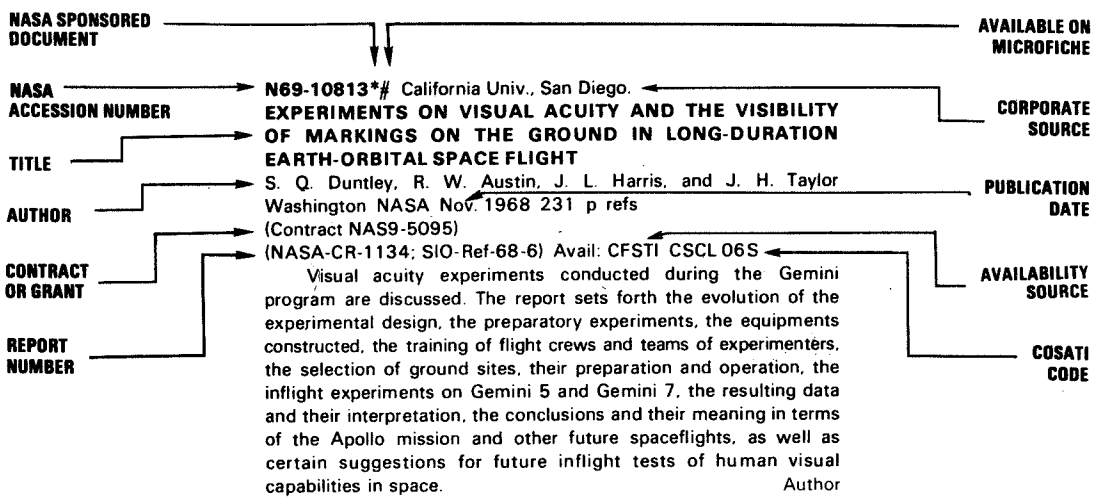

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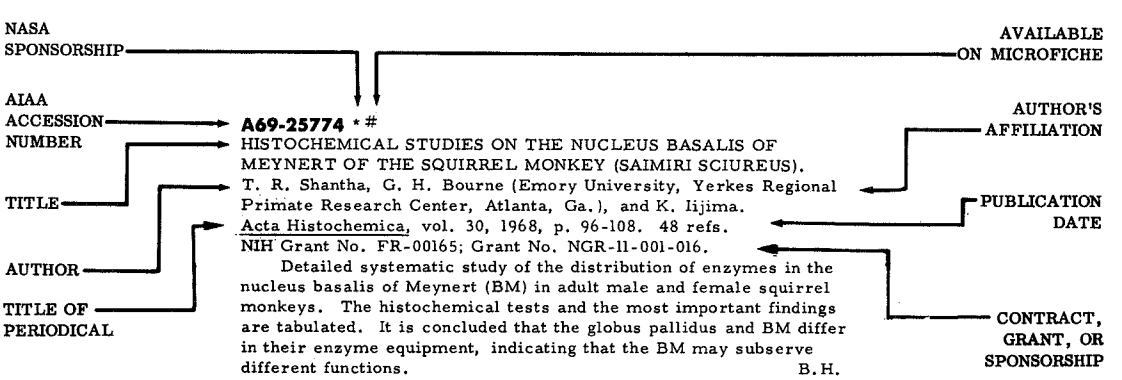

AEROSPACE MEDICINE AND BIOLOGY

a continuing bibliography JANUARY 1970

STAR ENTRIES

N69-38606*# McDonnell-Douglas Co., Santa Monica, Calif. Advance Biotechnology and Power Dept.

EVALUATION OF DESORBATES FROM A REGENERATIVE CO SUB 2 REMOVAL SYSTEM USED IN A 60-DAY MANNED TEST

P. P. Mader Oct. 1969 30 p refs

(Contract NASw-1539)

(NASA-CR-106214; MDCG1192) Avail: CFSTI CSCL 06K

Desorbates from silica gel and molecular sieve beds used as a part of a regenerative CO_2 removal unit in a life support system during a 60-day manned test were identified and quantified. The capacities of these two sorbers to adsorb and accumulate trace contaminants from the cabin atmosphere were compared. The results indicated that a significant amount of organic compounds was released from the silica gel and molecular sieve beds during the regenerative cycle. The daily reduction in organic contaminant level in the simulator (4,100-ft^3 volume) amounted to approximately 7.7 parts per million (ppm). The operation of the water recovery system inside the Space Station Simulator (SSS) inadvertently led to the formation of sizable quantities of ammonia because of incomplete pretreatment of urine. It was effectively adsorbed by the silica gel sorbent beds. The ammonia was generated at a rate equivalent to 32.0 ppm per day and was disposed of in the condensed water after regeneration. The silica gel unit helped remove the ammonia from the cabin at a faster rate than the water recovery post-treatment system could accomplish alone. Author

N69-38671# Oesterreichische Studiengesellschaft fuer Atomenergie G.m.b.H., Seibersdorf.

ON THE EFFECTS OF IONIZING RADIATION IN BARLEY [ZUR KENNTNIS DER WIRKUNG IONISIERENDER STRAHLUNG AUF GERSTE]

A. V. Szilvinyi 1969 29 p refs In GERMAN Submitted for publication

(SGAE-LA-1/1969) Avail: CFSTI

The effects of Co 60 gamma irradiation on the polyphenol-tyrosinase system were studied with a veiw toward improving the growth as well as technical uses (brewing) of the barley. The polyphenols (tannins) were found to be concentrated in the husks. A suitable extraction agent is 70%-ethyl alcohol. Four analytical methods were employed, involving the use of Fe II, $KMnO_4$, p-nitraniline, and UV absorption. The polyphenol content depends on the strain and the environment, and a positive correlation between the protein content and the polyphenol content was observed, both apparently being affected by the same environmental factors. Low gamma doses of about 10 to 20 krad increase the polyphenol content of the grain, but the content drops back to the original value at higher doses up to about 1000 krad. The tyrosinase is also concentrated in the husks. The best dissolving agent is water at 0°. The analyses were conducted manometrically based on O_2 losses and titrimetrically with n/100-$KMnO_4$. The tyrosinase activity also was found to depend on strain and environment, and the correlation between protein content and tyrosinase activity was again observed. However, no correlation was noted between polyphenol content and tyrosinase activity. At low doses, Co 60 gamma irradiation stimulates tyrosinase activity, while the activity decreases with doses above 20 krad. Transl. by K.W.

N69-38676# Joint Publications Research Service, Washington, D.C.

SPACE BIOLOGY AND MEDICINE, VOLUME 3, NO. 3, 1969

18 Sep. 1969 157 p refs Transl. into ENGLISH of the publ. "Kosmicheskaya Biologiya i Meditsina", v. 3, no. 3 Moscow, Meditsina Publishing House, 1969 p 3-92

(JPRS-48854) Avail: CFSTI

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N69-38678# Joint Publications Research Service, Washington, D.C.

STUDY OF A MATHEMATICAL MODEL OF A LIFE SUPPORT SYSTEM

B. A. Darg et al *In its* Space Biol. and Med., Vol. 3, No. 3, 1969 18 Sep. 1969 p 11 – 18 refs (See N69-38676 23-04)
Avail: CFSTI

A mathematical model was developed for a partially closed ecological system which includes man, n components of a biological or physicochemical nature, a supply storage unit and a waste management unit. The method described makes it possible to select an optimum life support system from systems with various lifetimes. A selection is made using the criterion of a minimum total mass of the system. On the basis of this criterion, the method establishes the most important characteristics of the system: critical masses of various substances, load on the components, and lifetime of the system. Author

N69-38679# Joint Publications Research Service, Washington, D.C.

STUDIES OF THE BIOLOGICAL EFFICIENCY OF THE MUSHROOM CANTHARELLUS CIBARIUS FR. MYCELIUM AND ITS USE AS FOOD

A. Torev et al *In its* Space Biol. and Med., Vol. 3, No. 3, 1969 18 Sep. 1969 p 19 – 23 refs (See N69-38676 23-04)
Avail: CFSTI

The mycelium of higher mushrooms grown in a liquid nutrient medium under industrial conditions is of a high biological efficiency. The nutritional value of the mycelium was evaluated in experiments on white rats. The weight gain of experimental and control animals was compared when fed *Cantharellus cibarius* Fr. mycelium, fresh milk, sour milk, and eggs added to the main diet. The addition of the mycelium resulted in a weight gain which was 34 to 35% greater than that produced by dry, fresh, and sour milk, and which was similar to that of eggs. The mycelium as well as the fruit body of mushrooms can be used for human nutrition. Author

N69-38681# Joint Publications Research Service, Washington, D.C.

VIABILITY OF CHLORELLA DURING CONTINUOUS CULTIVATION AFTER SINGLE GAMMA-IRRADIATION

I. S. Sakovich et al *In its* Space Biol. and Med., Vol. 3, No. 3, 1969 18 Sep. 1969 p 37 – 41 refs (See N69-38676 23-04)
Avail: CFSTI

The relationship between the survival of Chlorella during continuous cultivation and after gamma-irradiation is described. Cultivation was performed using the methods of regular suspension dilution and microcolonies. A comparison of the results obtained using the two methods suggests that changes in the yield of irradiated Chlorella are associated primarily with damage of its genetic and cytoplasmic structures. Photosynthetic activity remained unchanged. Author

N69-38682# Joint Publications Research Service, Washington, D.C.

VIABILITY OF MICROORGANISMS IN SPACE (RESULTS OF EXPERIMENTS MADE WITH ROCKETS AND HIGH-ALTITUDE BALLOONS)

P. Lorenz et al *In its* Space Biol. and Med., Vol. 3, No. 3, 1969 18 Sep. 1969 p 42 – 57 refs (See N69-38676 23-04)
Avail: CFSTI

Coliphage T1, weakened polio virus type I, spores of *Penicillium roqueforti* Thom., and the *Bacillus subtilis* strains M_1 and M_4 were exposed in an unshielded state at altitudes between 35 and 160 km aboard two rockets and two balloons. Small numbers of these microorganisms were sown and dried on plastic-coated aluminum plates. The process of sowing and drying the organisms resulted in a reduction in viability, dependent on the type of microorganism and the suspension medium. Two sets of controls were prepared: one set was flown in an overturned position (flight controls) and the other set was stored in the laboratory. The survival of the microorganisms was influenced by the intensity of solar radiation incident on the organisms, flight altitude, suspension medium, filter used, and sowing method employed. Author

N69-38683# Joint Publications Research Service, Washington, D.C.

INFLUENCE OF LOCAL STRESS ON DIFFERENTIATION OF IMMUNOCOMPETENT CELLS

V. Ya. Ganina et al *In its* Space Biol. and Med., Vol. 3, No. 3, 1969 18 Sep. 1969 p 58 – 64 refs (See N69-38676 23-04)
Avail: CFSTI

Experiments were carried out to study the effect of a nonspecific stimulus of the stress type on the proliferation and differentiation of immunocompetent cells. Guinea pigs were given an India ink suspension two days after secondary immunization. The animals showed a significant increase in the number of antibody-synthesizing cells on the fifth to seventh days after immunization. Analysis of cell-type dynamics shows that an increase in the number of plasmatic cells was due to a changed mode of their differentiation. Author

N69-38684# Joint Publications Research Service, Washington, D.C.

PECULIARITIES IN THE DEVELOPMENT AND PROLONGATION OF ARTIFICIAL HYPOBIOSIS IN RATS

L. L. Marfina et al *In its* Space Biol. and Med., Vol. 3, No. 3, 1969 18 Sep. 1969 p 65 – 75 refs (See N69-38676 23-04)
Avail: CFSTI

Seventy-five rats were kept in a state of artificial hypobiosis by the hibernation method. The state was maintained with the body temperature at 19 to 20°C for 24 hours. The total time of the experiment was 40 hours, including the time required for bringing about hypobiosis, its maintenance, and return of body temperature to a normal level. Changes in electroencephalograms, electrocardiograms, and respiration were observed during the three experimental stages. Survival of the animals was 71.4 percent in the experimental series, and 35.7 percent in the experimental series in which the body temperature was decreased to 17°C. Survival of restrained animals with fixed electrodes and sensors was significantly lower (25%). Author

N69-38685# Joint Publications Research Service, Washington, D.C.

DEPENDENCE OF CHANGES IN CEREBELLAR CORTEX ACTIVITY OF WHITE RATS ON MAGNITUDE OF THE IMPARTED ACCELERATION

L. D. Klimovskaya et al *In its* Space Biol. and Med., Vol. 3, No. 3, 1969 18 Sep. 1969 p 76 – 82 refs (See N69-38676 23-04)
Avail: CFSTI

White rats were subjected to transverse accelerations of 2

to 12g. Induced potentials of the cerebellar cortex were registered during sciatic nerve simulation. The acceleration effect inhibited cerebellar induced activity. Some animals exhibited the changes at 2g; these became statistically significant at 4g. With an increase in the imparted acceleration, the effect increased exponentially. The acceleration magnitude required for the threshold and suprathreshold responses was 6.4g and 7.6g. Author

N69-38686# Joint Publications Research Service, Washington, D.C.

INVESTIGATION OF PERFORMANCE OF A MAN-OPERATOR DURING A 64-HOUR SLEEP DEPRIVATION

R. M. Bayevskiy et al *In its* Space Biol. and Med., Vol. 3, No. 3, 1969 18 Sep. 1969 p 83-94 refs (See N69-38676 23-04)
Avail: CFSTI

The effects of 64-hour continuous work on the performance level of a man-operator were studied. It was found that a man-operator could perform at a sufficiently high level by receiving information transmitted as a digital, sound, or tactile code. Under these circumstances, the performance level depended on the motivation and interest of the test subject. Despite good performance, the overall health of the test subjects steadily deteriorated during the course of the 64-hour experiment. This was indicated by changes in the function of the central nervous and muscular systems and variations in biochemical indices. The 64-hour sleep deprivation and strenuous work resulted in serious disorders of the adaptation potentials of the body and this, in part, led to shifts in circadian rhythms of certain parameters. Author

N69-38687# Joint Publications Research Service, Washington, D.C.

BIOLOGICAL PRINCIPLES FOR FORMULATING A MODEL OF SENSORIMOTOR ACTIVITY OF A MAN-OPERATOR

A. M. Volkov et al *In its* Space Biol. and Med., Vol. 3, No. 3, 1969 18 Sep. 1969 p 95-101 refs (See N69-38676 23-04)
Avail: CFSTI

In order to understand the functions of a man controlling a spacecraft and its systems, the work of an operator in a closed control circuit was investigated. A model of operator activity was formulated using the relations between human perception of and response to fundamental signals and peculiar nerve structures. The basic regulatory part of the central nervous system was determined. A general approach to a study of the sensomotor activity of a man-operator in control systems of various degrees of complexity is outlined. Author

N69-38689# Joint Publications Research Service, Washington, D.C.

CHRONOTROPIC CARDIAC REACTION ACCOMPANYING EXPOSURE TO ACCELERATIONS

Ye. P. Tikhomirov *In its* Space Biol. and Med., Vol. 3, No. 3, 1969 18 Sep. 1969 p 110-118 refs (See N69-38676 23-04)
Avail: CFSTI

The chronotropic reaction of the heart in human subjects exposed to pelvis-to-head accelerations of 7 g and back-to-chest accelerations of different magnitudes was investigated. The angle between the acceleration vector and the longitudinal axis of the body was 65° (15 g), 78-80° (22 g), and 90° (12 g). The exposure time varied, reaching the maximum admissible value. Results of 800 experiments are discussed. Statistically significant data on the heart rate are given for each exposure. The maximum heart rate was noted upon exposures to pelvis-to-head accelerations whereas the minimum was found during exposures to back-to-chest accelerations at an angle of 90°. Exposures to back-to-chest accelerations of a magnitude greater than 12 g produced a relative depression of cardiac chronotropic activity which can be attributed to the reflex resulting from an increase in pulmonary pressure. Author

N69-38690# Joint Publications Research Service, Washington, D.C.

POSSIBLE USE OF AN ATMOSPHERE WITH A NONSTEADY GAS COMPOSITION IN SPACE CABINS

A. M. Genin *In its* Space Biol. and Med., Vol. 3, No. 3, 1969 18 Sep. 1969 p 119-129 refs (See N69-38676 23-04)
Avail: CFSTI

Two healthy male test subjects were confined for 35 days. The gas composition of the chamber was changed on a weekly basis, involving a 24-hour period of slight hypoxia, hypoxia combined with hypercapnia, hyperoxia, and a normal atmosphere. No significant deterioration of the responses to gas changes was found during the course of the experiment, as judged by data obtained by electro-encephalography, tachooscillography, and pulmonary ventilation at rest and during functional tests with a known physical load. The transition from one atmosphere to another produced a distinct regulatory effect on pulmonary ventilation, pulse rate, and bioelectric activity of the heart. Use of nonsteady gas mixtures offers promise for the prevention of physiological changes caused by long-term confinement. Author

N69-38701*# Aztec School of Languages, Acton, Mass. Research Translation Div.

PROBLEMS OF SPACE BIOLOGY, VOLUME 6

N. M. Sisakyan, ed. Washington NASA Jul. 1969 557 p refs Transl. into ENGLISH of the book "Problemy Kosmicheskoy Biologii, Tom. 6" Moscow, Nauka, 1967 p 1-528
(Contract NASw-1692)
(NASA-TT-F-528) Avail: CFSTI CSCL 06C

Presented are various studies on space biology and aerospace medicine. The effects of altered gravitation on humans and organisms and the biological action of radiation are investigated. For individual titles, see N69-38701 through N69-38759.

N69-38702*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.

SEVERAL PROBLEMS OF ECOPHYSIOLOGY

N. M. Sisakyan *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 1-18 Presented at the 2d Intern. Symp. on the Fundamental Probl. of Human Existence in Outer Space, Paris, 1-18 Jun. 1965 (See N69-38701 23-05)
Avail: CFSTI CSCL 06S

The overall trends of investigations are studied in the field of ecophysiology for the period since the launching of the first artificial earth satellite. An intimate relationship is shown between space physiology and the problems of exobiology on the one hand and between space physiology and the applied problems of creating biotechnical systems and developing methods for raising the stability of the organisms on the other. Results are given for terrestrial and aeronautical studies on the effect of factors in outer space (vacuum, cosmic radiation, characteristics of the temperature regime, etc.) and flight (artificial gas environment, pressure, dynamic factors) on living organisms. Author

N69-38703*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.

THE PHYSIOLOGICAL EFFECTS OF GRAVITATION

O. G. Gazenko et al *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 19-40 refs Presented at 6th Intern. Symp. of COSPAR, Buenos Aires, 10-21 May 1965 (See N69-38701 23-05)
Avail: CFSTI CSCL 06S

Several general questions on the biological role of gravitation and also the physiological effects of weightlessness observed in biological experiments and in astronauts' flights are discussed. The mechanisms of adaptation of an organism to new gravitational conditions, the role of separate parts of the nervous system, and compensations and replacements of functions in the following

spheres are examined: sphere of afferentation and analyzer activity; effector sphere and coordination of movements; sphere of regulation of the vegetative functions. Several conclusions are drawn on the ways in which studies should be made on the methods for selecting, preparing and conditioning the astronauts for unusual conditions in future lengthy flights. Author

N69-38704*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.

THE PROBLEM OF GATHERING DIAGNOSTIC INFORMATION UNDER THE CONDITIONS OF A SPACE FLIGHT AS ONE OF THE TRENDS IN MEDICAL CYBERNETICS

V. V. Parin et al *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 41–51 refs Presented at 16th Intern. Astronaut. Congr., Athens, 13–18 Sep. 1965 (See N69-38701 23-05)

Avail: CFSTI CSCL 06D

New concepts on gathering diagnostic information under the conditions of a space flight are examined in this article as one of the trends in medical cybernetics. The term physiological measuring-informational system is proposed, and four important aspects of this problem are selected. New promises are presented for developing systems for gathering diagnostic information relative to space flights continued for a great length of time, using on-board calculating devices, and constructing effective diagnostic algorithms on the basis of treating a limited volume of physiological data. Author

N69-38705*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.

SOME RESULTS OF MEDICAL STUDIES CONDUCTED DURING THE FLIGHT OF THE "VOSKHOD"

Yu. M. Volynkin et al *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 52–66 refs Presented at 2d Intern. Symp. on the Probl. of Human Life in Space, Paris, 14–18 Jun. 1965 (See N69-38701 23-05)

Avail: CFSTI CSCL 06S

A general resumé is given for the results of medical studies made with the aid of biotelemetry systems and portable scientific equipment during the flight of the Voskhod. The astronauts' physiological reactions at individual stages of the flight are analyzed, and hypotheses on their origin are presented. It is emphasized that the results of the studies did not reveal any pathological reactions, but provided a possibility for interpreting their individual characters. The data obtained are analyzed in the light of prospects for the development of astronautics. Author

N69-38706*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.

BIOLOGICAL STUDIES ABOARD THE SPACECRAFT "VOSTOK" AND "VOSKHOD"

V. V. Antipov *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 67–83 refs Presented at 3d Intern. Symp. on Bioastronaut. and Space Res., San Antonio, 16–18 Nov. 1964 (See N69-38701 23-05)

Avail: CFSTI CSCL 06S

The principal results of biological experiments conducted on 11 recovered spacecraft are examined: An analysis of the completed studies showed that, various flight factors cause disorders in the hereditary structures of different biological materials: cells in the bone-marrow of mice, seeds of higher plants, lysogenic bacteria, microspores of spiderwort, and others. These disorders have a small but statistically reliable value. At the same time, it was established that a combination of flight factors did not cause any persistent and expressed changes in the vital activity of mammals and man. The great practical significance of the biological experiments made on flights before man was launched into space is noted. Author

N69-38707*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.

ELECTROENCEPHALOGRAPHIC STUDIES IN SPACE MEDICINE

O. G. Gazenko et al *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 84–93 (See N69-38701 23-05)

Avail: CFSTI CSCL 06N

The electroencephalographic method (EEG) is examined in relation to the tasks of space medicine. It is shown that the EEG can be used successfully for selecting astronauts, in the system of medical control during the preflight preparation period, and during space flight. The EEG provides an objective determination of an astronaut's level of sleep and wakefulness, and the state of his working capacity. Author

N69-38708*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.

HUMAN PHYSIOLOGICAL REACTIONS TO THE EFFECT OF ACCELERATION DURING SPACE FLIGHT

P. V. Vasilyev et al *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 94–106 refs Presented at 16th Intern. Astronaut. Congr., Athens, 13-18 Sep. 1965 (See N69-38701 23-05)

Avail: CFSTI CSCL 06S

The results of experimental studies, obtained during actual space flights and laboratory tests on the effect of transverse accelerations are presented in this article. A comparative analysis of the reactions for the astronauts aboard the Vostok and Voskhod is given for the effect of accelerations during a flight and during rotation in a centrifuge. The results of examining the tolerance to accelerations after a long period of hypodynamia (under conditions of strict confinement), imitating certain effects of weightlessness, are presented. Certain methods for increasing an organism's resistance to the effect of accelerations are examined (physical exercises, pharmacological methods, adaptation to hypoxia under the conditions of a pressure chamber or a high mountain). Author

N69-38709*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.

HUMAN PHYSIOLOGICAL REACTIONS DURING THE ACTION OF TRANSVERSE ACCELERATIONS FOLLOWING HYPODYNAMIA

A. R. Kotovskaya et al *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 107–118 refs (See N69-38701 23-05)

Avail: CFSTI CSCL 06S

The physiological reactions to, and tolerance for accelerations were studied in tests on subjects following hypodynamia which lasted from 7 to 20 days. Examinations were made of the bioelectric activity of the heart, the cerebral cortex, the function of external respiration, the arterial pressure, and the visual function. The decrease in tolerance to accelerations in all cases averaged 2 units, and did not depend on the duration of hypodynamia. Physiological reactions to accelerations were greater following hypodynamia. The decrease in tolerance to accelerations was caused mainly by a disorder in the regulation of the vascular tonus. Author

N69-38710*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.

THE MECHANISM OF THE CHANGE IN CARDIAC ACTIVITY DURING TRANSVERSELY-DIRECTED ACCELERATIONS

V. Ye. Belay et al *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 119–125 refs (See N69-38701 23-05)

Avail: CFSTI CSCL 06S

The effect of long periods of transversely-directed accelerations is accompanied by intensive expenditure of glycogen in the myocardium and liver. The degree of the disorders in cardiac activity during accelerations is correlated with the amount of glycogen in the myocardium. One of the pathogenic links in the exhaustion of the compensatory mechanisms for cardiac activity during long periods of transversely-directed accelerations is probably the rapid

decrease in the mocardial energy resources. The normalization of elements in the electrocardiogram during the period of after-effects from acceleration is not an indicator of complete recovery of myocardial function. Author

N69-38711*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.

THE EFFECT OF LONG PERIODS OF TRANSVERSE ACCELERATIONS ON THE FUNCTIONAL STATE OF THE VEGETATIVE NERVOUS SYSTEM

V. Ye. Belay *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 126–134 refs (See N69-38701 23-05)

Avail: CFSTI CSCL 06C

The effect of transverse accelerations on the vegetative nervous system was studied in experiments with rabbits and dogs, involving their reaction to adrenalin, acetylcholine, and electrical stimulation of the vagus nerve. It was established that within 15–20 min after the action of the accelerations, there is a change in the organism's reaction and an irritation of the vagus nerve. In this case, the length of time for individual orbits of the arterial pressure and the coronary blood flow are changed, as is the rate of heart contractions. The character of the reaction correlates with the degree of the disorders in cardiac activity during the action of accelerations and in the period following their application. Author

N69-38712*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.

MODELING THE FUNCTION OF REGULATION OF THE CARDIOVASCULAR SYSTEM DURING WEIGHTLESSNESS

I. I. Kasyan et al *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 135–143 refs (See N69-38701 23-05)

Avail: CFSTI CSCL 06D

The problem of applying methods of mathematical modeling to a study of the function of the cardiovascular system is examined. Mathematical expressions and electrical circuits are presented for models which reflect the general rules for the function of this system under conditions on earth and during weightlessness. The model obtained is used for examining particular features in the functioning of the cardiovascular system when carrying out physical work during weightlessness. Author

N69-38713*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.

REACTION OF THE HUMAN ORGANISM TO THE EFFECT OF RAPIDLY INCREASING ACCELERATION DURING LANDING

A. S. Barer et al *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 144–149 refs (See N69-38701 23-05)

Avail: CFSTI CSCL 06S

The tolerance of a human subject to rapidly-increasing accelerations during landing, and certain ways for increasing resistance to them, are examined. The limits of good tolerance and the sypmtoms indicating an approach to these limits, as well as the nature of the changes in the functional systems of the organism are established. The maximum endurable accelerations were found to be those of 22-23 units, with a rate of increase of 4000-5000 units/sec acting for 0.03-0.04 sec in the head–pelvis direction and 35-40 units in the chest–back direction. Author

N69-38714*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.

EFFECT ON MAN PRODUCED BY ACCELERATION DURING LANDING IN A CABIN, DEPENDING ON THE DEGREE OF SHOCK ABSORPTION AND THE FORCE OF HORIZONTAL WINDS

G. P. Mirolyubov et al *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 150–156 refs (See N69-38701 23-05)

Avail: CFSTI CSCL 05E

The conditions for landing in a cabin are examined in this article as depending on the damping properties of the shock absorbers, the position of the subject in the seat, and the velocity of the wind drift. The shock absorber, which damps the impact evenly and rapidly, guarantees a safe landing for the subject in the cabin in a sitting or semi-reclining position at a velocity of vertical descent of 20 m/sec, with a minimum braking rate of 8 m/sec. The subjects' greater resistance to accelerations in the directions chest-back and back–chest provide a basis on which the introduction of a manual or automatic turning of the cabin, in order to increase landing safety, is recommended. Author

N69-38715*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.

THE PROBLEM OF DISORDERS IN LOCAL BLOOD CIRCULATION IN MAN DURING PROLONGED TRANSVERSELY-DIRECTED ACCELERATION

M. D. Yemelyanov et al *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 157–160 refs Presented at 16th Intern. Astronaut. Congr., Athens, 13-18 Sep. 1965 (See N69-38701 23-05)

Avail: CFSTI CSCL 06D

The results of studying the retinal blood circulation are presented; it is shown that the retinal arteries can reflect both the condition of the local blood circulation in the eye and changes in the hemodynamics of the brain. The blood circulation was studied during the action of accelerations of various degrees. The authors state their opinion that only a comprehensive and detailed examination of the mechanism for the disorders in the hymodynamics during accelerations can solve the problems regarding rational regimes for preparing and training a special crew. Author

N69-38716*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.

PROBLEM OF THE ORIGIN OF OPTIC DISORDERS DURING ACCELERATION

B. M. Savin *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 161–171 refs (See N69-38701 23-05)

Avail: CFSTI CSCL 06C

The functional condition of the optic analyzer is examined during the effect of accelerations. It was shown that accelrations have a significant effect, both on the spontaneous bioelectric activity of various divisions of the optic analyzer, and on the course of phenomena related to the action of adequate stimuli. The results of the studies show the corticoretinal nature of the disorders observed. Author

N69-38717*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.

CHARACTERISTICS OF VEGETATIVE REACTIONS IN MAN DURING THE ACTION OF ANGULAR ACCELERATIONS WITH VARYING VALUES AND DURATIONS

B. I. Polyakov *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 172–179 refs (See N69-38701 23-05)

Avail: CFSTI CSCL 06S

It was established that a single application of negative acceleration from 15° sec^2 (duration of action = 6 sec) to 1200° sec (duration of action = 0.15 sec), vegetative reactions can occur in subjects in the form of a retardation of the pulse and respiration, and an increase in arterial pressure. In most cases, the reactions have a latent period of not more than 20 sec, and they do not depend on the magnitude of the effect. The reactions also do not depend on the degree of the subjects' resistantance to motion-sickness, and they have relatively little prognostic value under the given stimulation conditions. Author

N69-38718*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.

EFFERENT PULSES FROM THE VAGUS NERVE IN INTACT ANIMALS AND IN ANIMALS WHOSE LABYRINTHS WERE

REMOVED DURING WEIGHTLESSNESS

Ye. M. Yuganov et al *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 180–184 refs (See N69-38701 23-05)

Avail: CFSTI CSCL 06C

Efferent impulses from the vagus nerve were studied in intact animals and animals whose labyrinths were removed, under the conditions of short-period weightlessness. It was found that in the intact animals the pulse rate decreases; this effect becomes intensified during the cumulative effect of weightlessness. In rabbits whose labryinths were removed, the character of the pulses remains practically unchanged. The data obtained show the intermediary mechanisms for the appearance of vestibular disorders, and they can be used for studying the problem of space-sickness. Author

N69-38719*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.

THE PROBLEM OF THE INTERRELATIONSHIP BETWEEN THE FUNCTION OF THE SEMICIRCULAR CANALS AND THAT OF THE OTOLITH APPARATUS

S. S. Markaryan *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 185–190 refs (See N69-38701 23-05)

Avail: CFSTI CSCL 06S

The degree of nystagmus was studied in 9 subjects during acceleration in the head region (0.5 and 1.0 units). The data obtained showed that stimulation of the otolith apparatus during the action of accelerations, particularly positive ones, activates the amount of indicators of vestibular nystagmus. During the action of the accelerations, the subjects' sensations of their position relative to the axis of rotation changed. Author

N69-38720*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.

CUMULATION OF STIMULI IN MOTION SICKNESS

I. D. Pestov *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 191–197 refs (See N69-38701 23-05)

Avail: CFSTI CSCL 06C

During rocking and nonuniform rotation of dogs, their pulse rate and rate of respiration remain relatively constant; there is, however, a constant increase in the excitability of the emetic center, which is found in the emetic reaction to the administration of apomorphine in subcritical doses. The formation of an emesis of any etiology leads to sharp and regular changes in the rate of heart contractions and respiration. The process of the cumulation of stimuli during motion sickness is linked with the function of the emetic center, which transmits (up to a certain limit) the afferent impulses to the centrifugal part of the reflex arc and then, being stimulated intermittently, causes vomiting and the vegetative changes corresponding to it. Author

N69-38721*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.

MATHEMATICAL MODELING OF THE FUNCTION OF THE VESTIBULAR APPARATUS DURING WEIGHTLESSNESS

N. A. Chekhonadskiy *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 198–210 refs (See N69-38701 23-05)

Avail: CFSTI CSCL 06D

The problem of applying methods of mathematical modeling to the study of the function of the otolith section of the vestibular apparatus is examined. The characteristics of the model for the utricular receptors during the action of acceleration on an organism are presented. The presence of certain general rules in these cases, expressed in the appearance of an alternating component at the outlet of the integrator, is established. Author

N69-38722*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.

APPLYING CORRELATION ANALYSIS TO A STUDY OF THE REACTION OF SINGLE NERVE ELEMENTS IN THE CEREBRUM OF CATS TO STIMULATION OF THE VESTIBULAR APPARATUS BY ROCKING

M. G. Kutateladze et al *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 211–216 ref (See N69-38701 23-05)

Avail: CFSTI CSCL 06C

The reactions of single nerve cells in the visual region of the cerebral cortex (17-18th region according to Broadman) and of the reticular formation of the medulla oblongata (n. gigantocellularis) were examined in cats during rocking. The microelectrode technique was used for recording the potentials of the effect. The results of analyzing the change in the frequency of response showed that a change in the pulse rate is observed in both regions during rocking. In examining the rate for the same neurons, with the aid of the correlation analysis, it was found that the reaction to the magnitude of the rocking is observed in the reticular formation of the medulla oblongata, and is not observed in the visual region of the cortex. Author

N69-38723*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.

THE REACTION OF SINGLE NEURONS IN THE AUDITORY REGION OF THE CEREBRAL CORTEX IN CATS TO AN ADEQUATE STIMULATION OF THE VESTIBULAR APPARATUS

M. G. Kutateladze *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 217–221 refs (See N69-38701 23-05)

Avail: CFSTI CSCL 06S

The effect of adequate stimulation of the vestibular apparatus is examined for the activity of the neurons in the auditory region of the cerebral cortex. A microelectrode technique was used for recording from the neurons. The results obtained were processed by a method of correlation analysis. It was shown that despite the change in the frequency characteristic of the impulse activity in the neuron, the correlation characteristics did not show any relationship between the change in the activity of the neuron and the change in the value of the acceleration. Because of this, it was assumed that stimulation of the vestibular apparatus has a non-specific effect on the auditory region of the cerebral cortex. Author

N69-38724*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.

ACTIVITY OF INDIVIDUAL NEURONS IN THE RETICULAR FORMATION OF THE MEDULLA OBLONGATA (N. GIGANTOCELLULARIS) IN CATS DURING ROCKING

N. V. Merabishvili *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 222–228 refs (See N69-38701 23-05)

Avail: CFSTI CSCL 06S

The reactions of individual nerve elements in the reticular formation of the medulla oblongata (n. gigantocellularis) in cats are examined for an adequate stimulation of the otolith apparatus by rocking. A microelectrode technique was used for recording the potentials. The results were analyzed with the aid of a correlation analysis which indicated that the majority of the reticular neurons in question (85.6%) showed a specific reaction to a change in the value of the acceleration. Author

N69-38725*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.

THE EFFECT OF ADAPTATION TO DECREASED PARTIAL PRESSURE OF OXYGEN ON RESISTANCE TO ACCELERATIONS

P. V. Vasilyev et al *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 229–249 refs (See N69-38701 23-05)

Avail: CFSTI CSCL 06S

White mice, rats, guinea pigs, and rabbits were used in

the experiments. In order to evaluate the organism's functional condition before and after training for hypoxia, the quantity of erythrocytes and hemoglobin and the level of the gas metabolism were determined. In a number of experiments, the electrocardiograms and pneumograms were recorded before, during, and after rotation. The quantity of erythrocytes and hemoglobin increased after adaptation to hypoxia; the oxygen requirement did not change substantially. The survival rate for the adapted animals during the effect of the accelerations was 24-46% higher than for the control animals. The increased resistance was retained for two to three weeks. Author

N69-38726*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.

CHANGE IN THE RESISTANCE OF AN ORGANISM TO ACCELERATIONS AFTER THE PROLONGED EFFECT OF SMALL CONCENTRATIONS OF CARBON DIOXIDE

V. P. Zagryadskiy et al *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 250–257 (See N69-38701 23-05)

Avail: CFSTI CSCL 06S

Placing rabbits in an atmosphere with 3-5% carbon dioxide involves a period of prolonged aftereffects which are characterized by changes in the respiration, cardiovascular activity, and bioelectric potentials of the brain, and by a decrease in the body temperature, as well as leukocytosis. During this period, the animals' resistance to the effect of accelerations in a transverse direction, with values from 4.5 to 7 units, is found to be significantly lowered. The change in the animal's reaction when it is affected by small concentrations of carbon dioxide is accompanied by a sharp suppression of the bioelectric activity of the brain; changes in the electrocardiogram indicate a disorder in the excitation behavior as manifested by pareses and paralyses of the posterior extremities. Author

N69-38727*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.

CHANGE IN OXYGEN CONTENT IN BRAIN TISSUE DURING THE EFFECT OF ACCELERATIONS IN VARYING DIRECTIONS

B. M. Savin *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 258–265 refs (See N69-38701 23-05)

Avail: CFSTI CSCL 06S

The oxygen pressure in the tissues of the cerebrum was studied in cats and rabbits during the effect of accelerations. It was established that the change of the pO_2 in the brain tissue depends on the value as well as the vector of the stress. The greatest decrease in the pO_2 is observed for the direction pelvis–head for 5–7 units, which corresponds to a climb to an altitude of 9–10,000 meters. For the same values of the effect in the direction head–pelvis, the changes correspond to those which take place at a climb of 3–5,000 meters. Author

N69-38728*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.

MORPHOLOGICAL AND CERTAIN HISTOCHEMICAL CHANGES IN THE PRECORONARY REGION OF THE CEREBRAL CORTEX IN DOGS DURING THE EFFECT OF TRANSVERSE ACCELERATIONS

D. I. Medvedev *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 266–273 refs (See N69-38701 23-05)

Avail: CFSTI CSCL 06S

The morphological changes in the precoronary region of the cerebral cortex in male dogs were examined for the effect of the following accelerations: 8 units for 3 minutes and 12 units for 1 minute. There were some small hemorrhages, and occasional vacuolization of the cytoplasm and chromotolysis of the nerve cells. Changes in the quantity of ribonucleic acid in the cytoplasm and nucleus of the nerve cells are also described. These changes have a reversible nature. Author

N69-38729*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.

REACTION AND ADAPTATION OF THE CENTRAL NERVOUS SYSTEM TO STAGNANT ANOXIA (RADIAL ACCELERATION IN ONTOGENESIS)

L. Jiflek et al *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 274–282 refs (See N69-38701 23-05)

Avail: CFSTI CSCL 06S

The resistance of the central nervous system to hypoxia, which is formed by a positive radial acceleration of a value of 10 g, is examined in rats during early postnatal ontogenesis. Resistance to hypoxia is linked with age. The younger the animal, the fewer the disorders observed in the central nervous system during accelerations. The older the animal, the more differentiated the nerve tissue and the lower the tolerance. Author

N69-38730*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.

X-RAY PHOTOGRAPHY OF THE HUMAN CHEST DURING ACCELERATIONS VARYING IN MAGNITUDE AND DIRECTION

K. I. Murakhovskiy *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 283–290 refs (See N69-38701 23-05)

Avail: CFSTI CSCL 06S

A description of the X-ray picture of the human chest is given on the basis of 36 experiments for the effect of transversely-directed accelerations with values from 2 to 12 g. The experiments were conducted in the direction of the summary vector for the acceleration, at angles of 65°, 80', and 90° from the lengthwise axis of the subject's body. On the X-ray photographs obtained, there is a decrease in the dimensions of the chest, a displacement of the diaphragem, characteristic changes in the transparency of the pulmonary areas, and complex dislocations of the heart and other organs of the mediastinum. A clear qualitative relationship is established between the above-mentioned changes and the magnitude and direction of the acting acceleration. Author

N69-38731*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.

CERTAIN CHANGES IN THE LUNGS OF DOGS DURING THE EFFECT OF SINGLE AND REPEATED TRANSVERSE ACCELERATIONS

Yu. N. Korolev *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 291–295 refs (See N69-38701 23-05)

Avail: CFSTI CSCL 06S

The lungs of 20 male dogs, subjected to single (12 units for 1 min) and repeated (from 3 to 12 units for varying exposures) transverse accelerations in the chest–back direction were examined. The changes detected (hemorrhages, inflammatory processes, etc.) in both series of experiments have a uniform nature, and undergo reverse development with time. Author

N69-38732*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.

THE EFFECT OF TRANSVERSELY-DIRECTED ACCELERATIONS ON THE FUNCTIONS OF THE KIDNEY

P. V. Vasilyev et al *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 296–302 refs (See N69-38701 23-05)

Avail: CFSTI CSCL 06C

In experiments on 7 dogs, with their ureters extended by the L.A. Orbeli method, the authors examined the effect of transversely-directed stresses with values of 5, 8, and 12 units on the function of the kidneys. It was established that, by the effect of these accelerations, there develops a slight osmotic diuresis, an increase in the excretion of sodium and potassium, and certain other divergences from the norm which have a brief duration. The possible mechanisms for the changes observed, among which the activation of the hypothalamic-hypophyseal system by the effect of the accelerations is of primary significance, are discussed in this article. Author

N69-38733*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.

MORPHOLOGICAL CHANGES IN THE KIDNEYS OF DOGS AFFECTED BY SINGLE TRANSVERSE ACCELERATIONS

V. V. Korolev *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 303–308 (See N69-38701 23-05)

Avail: CFSTI CSCL 06C

With the aid of histological and histochemical methods, studies were conducted on the changes in the kidneys of male dogs, occurring as a result of the single effect of transverse accelerations with a value of 8 units for 3 min. The morphological changes found during the initial periods had the form of disorders in the intrarenal blood flow, the appearance of small hemorrhagic foci, and the development of hypoxia of the renal tissues. These disorders coincided with the appearance of dystrophic changes in the epithelial cells of the renal tubules. The dynamics of these morphological changes show that these disorders have a recoverable nature. Author

N69-38734*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.

THE CONDITION OF THE LYMPH GLANDS IN ANIMALS DURING SINGLE AND REPEATED ACCELERATIONS

Yu. I. Afanasyev et al *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 309–320 (See N69-38701 23-05)

Avail: CFSTI CSCL 06C

An examination of the lymph nodes and spleen in dogs, after the effect of both single and repeated accelerations, showed that there are phase changes in lymphosozesis in the lymph glands, in the activity of the recticular-endothelial system, and in the structural contracting apparatus of the spleen. The degree of the changes in the lymph glands varies for both the animals in one series of the experiments and for the animals in different series. In analyzing the changes in the lymph nodes and the spleen, special significance is given to the specifics of the functions of each of these organs in the dogs, as well as to the effect of various factors arising during accelerations. Author

N69-38735*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.

PATHOMORPHOLOGICAL CHANGES DURING THE EFFECT OF RADIAL ACCELERATIONS IN THE "HEAD–FEET" DIRECTION

V. G. Petrukhin et al *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 321–331 refs (See N69-38701 23-05)

Avail: CFSTI CSCL 06C

Pathomorphological changes in the organs of dogs, occurring during rotation along the axis which passes through the pelvic area, at various angles of inclination for the trunk (0, 20, 70°), were examined. The results of the examinations showed that, for the effect of accelerations of 2.3 g and more at the level of the head, before the appearance of a "collapse" in the compensation of the cardiovascular activity, there are hemorrhages, edemata, and dystrophic processes in the cerebrum, myocardium, lungs, and other organs. Author

N69-38736*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.

THE EFFECT OF REPEATED ACCELERATION ON THE HISTOLOGICAL STRUCTURE OF THE LIVER

Ye. F. Kotovskiy et al *In its* Prob. of Space Biol., Vol. 6 Jul. 1969 p 332–337 (See N69-38701 23-05)

Avail: CFSTI CSCL 06C

The effect of repeated, transversely-directed accelerations, with values up to 12 units, on the histological structure of the liver was examined in dogs. The repeated accelerations cause the appearance of venous hyperemia, hemorrhaging, embolism and trombosis of the vessels, vacuolization of the cytoplasm in the hepatic cells, and a decrease in the content of RNA and α-amino acids in these cells. These changes are similar to those which are observed during the effect of single stresses of 8-12 units. Author

N69-38737*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.

EFFECT OF MAXIMUM TOLERABLE STRESSES WITH TIME ON THE HISTOSTRUCTURE OF THE LIVER IN MONKEYS

Ye. F. Kotovskiy et al *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 338–343 refs (See N69-38701 23-05)

Avail: CFSTI CSCL 06C

The effect of transverse, maximum tolerable stresses with time, repeated 12 times, on the structure of the liver was examined in monkeys. Observed were venous hyperemia, destruction of the cells in the blood vessel and hemorrhages as well as thrombosis of the vessels, vacuolization and adiposis of the cytoplasm in the hepatic cells; there was also a decrease in the quantity of RNA and α-amino acids in the hepatic cells. The changes had a recoverable nature. Author

N69-38738*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.

THE EFFECT OF PROLONGED TRANSVERSELY-DIRECTED RADIAL ACCELERATIONS ON THE MOTOR ACTIVITY OF THE UPPER PART OF THE GASTROINTESTINAL TRACT IN DOGS

A. P. Mukhina et al *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 344–348 refs (See N69-38701 23-05)

Avail: CFSTI CSCL 06C

The data from studies of the periodic motor activity of the stomach, associated with hunger, as well as of the duodenum, are presented in relation to the effect of transversely-directed radial accelerations (back-chest) of 8 g for 3 min. The examinations conducted showed that singly-imposed accelerations cause a change in the relationship between the periods of work and rest in the motor activity of the stomach, and of the duodenum in particular, with after effects persisting for about three weeks. The rhythmic and peristaltic activity of these regions of the digestive apparatus remained unchanged during a two-month period of observation after the effect of the accelerations. Author

N69-38739*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.

THE PROBLEM OF THE ROLE OF THE SMALL INTESTINE IN THE REGULATION OF THE LEVEL OF CHOLESTEROL IN THE BLOOD, DURING THE EFFECT OF TRANSVERSELY-DIRECTED RADIAL ACCELERATIONS

M. S. Martsevich et al *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 349–352 refs (See N69-38701 23-05)

Avail: CFSTI CSCL 06C

The change in the cholesterol content in the blood and in the intestinal juice was examined after the effect of radial accelerations in dogs with isolated sections of the small intestine.

It was established that the effect of transversely-directed radial accelerations causes an increase in the cholesterol content in the blood, with a simultaneous decrease in its content in the intestinal juice. In the case of an increase of the cholesterol content in the intestinal juice after the accelerations, there was no hypercholesterinemia observed. Author

N69-38740*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.

THE ROLE OF THE CENTRAL NERVOUS SYSTEM IN THE REGULATION OF THE SECRETORY ACTIVITY OF THE SMALL INTESTINE, AFTER THE EFFECT OF PROLONGED TRANSVERSE ACCELERATIONS

V. Ye. Potkin *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 353–355 (See N69-38701 23-05)

Avail: CFSTI CSCL 06C

The materials from a study of the secretory activity of the small intestine after the effect of prolonged transverse accelerations (8 g for 3 min) are presented in relation to dogs with isolated normal and denervated intestinal sections. The differences in the secretion of the intestinal juice and the enzymes of

enteropeptidase, alkaline phosphatase, amylase, and lysozyme by different sections are shown. The important role of the central nervous system in the regulation of the secretory activity of the small intestine is established. Author

N69-38741*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.
WEIGHTLESSNESS AND CELL DIVISION IN MICROSPORES OF TRADESCANTIA PALUDOSA
N. L. Delone *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 356–367 (See N69-38701 23-05)
Avail: CFSTI CSCL 06C

Grafts of Tradescantia paludosa, with racemes in special bio-cartridges, were placed in the cabins of the Vostok-3, Vostok-4, Vostok-5, Vostok-6, and Voskhod spacecraft. Five types of disorders of mitosis in the microspores of the Tradescantia, related to the effect of weightlessness, were found. Author

N69-38742*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.
CHANGES OF CERTAIN BIOCHEMICAL INDICES IN ANIMALS DURING THE EFFECT OF ACCELERATION AFTER gamma-IRRADIATION
Ye. A. Abaturova et al *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 368–376 refs (See N69-38701 23-05)
Avail: CFSTI CSCL 06C

Tissue respiration and hydrogenase activity in the cerebrum, myocardium and small intestine were examined during the effect of acceleration on irradiated animals. There was a small increase in the tissue respiration and the activity of the glycerophosphatin dehydrogenase was decreased for two days. The changes in the tissue respiration in the cerebrum and myocardium were insignificant. There was an increase in the activity of the alkaline phosphatase in the tissue of the stomach. Author

N69-38743*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.
HEMATOLOGICAL AND PATHOMORPHOLOGICAL CHANGES IN ANIMALS UNDER THE CONDITIONS OF AN EXPERIMENT WHICH MODELS THE EFFECT OF IONIZING RADIATION AND FLIGHT FACTORS ON AN ORGANISM
N. A. Gaydamakin et al *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 377–387 refs (See N69-38701 23-05)
Avail: CFSTI CSCL 06R

A repeated preliminary irradiation of guinea pigs up to total doses of 50 and 75 r, with a following effect fractionated by 3 r, leads to changes in the composition of the peripheral blood. Within 1.5 months after the termination of the radiation, for a total dose of 90 r, the following are observed: a decrease of the follicles in the spleen, a decrease in the quantity of cellular elements and iron-containing pigment in the pulp, a thickening of the walls of the central arteries for the follicles of the spleen, and hemorrhages in the mucus of the stomach and the tissue of the lung. Degenerative-dystrophic changes are found in the intramural apparatus of the urinary bladder of the irradiated animals. In applying ACTH, the changes are more weakly pronounced during the recovery period. Author

N69-38744*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.
COMPLEX EFFECT OF CERTAIN TYPES OF IONIZING RADIATION AND DYNAMIC FLIGHT FACTORS ON THE HEMOPOIETIC ORGANS OF MICE (PATHOMORPHOLOGICAL STUDIES)
N. A. Gaydamakin et al *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 388–400 refs (See N69-38701 23-05)
Avail: CFSTI CSCL 06R

It was shown that the preliminary effect of a single vibration, 3 days before irradiation with protons intensified the damage to the lymphoid tissue in the spleen and lessened the damage to the hemopoietic cellular elements of the myeloblastic and erythroblastic growths in the spleen and bone marrow. The recovery of all types of hemopoietic tissue in these organs was accelerated. The effect of vibration intensified the destructive changes in the hemopoietic organs. The effect of acceleration, applied one day before the γ-irradiation, decreased the devastation of the hemopoietic organs and accelerated their recovery. The effect of acceleration, applied one day after the γ-irradition, had no definite relation to the degree of the radiation damage to the hemopoietic organs. Author

N69-38745*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.
THE REACTIVITY CONDITION OF AN ORGANISM DURING THE COMPLEX EFFECT OF SEVERAL SPACE-FLIGHT FACTORS
V. V. Antipov et al *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 401–415 refs Presented at the 16th Intern. Astronaut. Congr., Athens, Sep. 1965 (See N69-38701 23-05)
Avail: CFSTI CSCL 06R

The results presented in the article show that the dynamic factors of a flight substantially change the reaction of an organism to the effect of ionizing radiation. In this case, the directionality and magnitude of the changes depend on the nature and force of the stimulus, the time, and the sequence for the effect of the factors, the type of object, etc. The opinion is given that these facts should be considered in establishing the maximum-tolerable doses of radiation for the crew members of the craft, and in developing methods and means of counterradiation protection for the biological objects which are involved in the ecological complex. Author

N69-38746*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.
RELATIVE BIOLOGICAL EFFECTIVENESS AND PICTURE OF RADIATION DAMAGE UNDER THE INFLUENCE OF IONIZING RADIATIONS WITH VARIOUS VALUES FOR LINEAR LOSSES OF ENERGY
V. V. Antipov et al *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 416–426 refs (See N69-38701 23-05)
Avail: CFSTI CSCL 06R

The article gives experimental data on the biological effectiveness of ionizing radiations which vary in LLE (linear losses of energy). A congruity was established in the general picture for severe radiation damage caused by the effect of isoequivalent ionizing radiations which differ in LLE, particularly in the degree of injury to the hemopoietic organs. However, the RBE (relative biological effectiveness) coefficients of various ionizing radiations for severe damage cannot be used for evaluating the biological effect of radiation when the remote aftereffects of radiation sickness are of primary importance. Author

N69-38747*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.
RELATIONSHIP BETWEEN THE FUNCTION OF THE THYROID GLAND AND THE CHOLINESTERASE ACTIVITY OF THE HYPOTHALAMUS, THALAMUS, PALEO-, ARCHEO-, AND NEOCORTEX IN DOGS SUFFERING FROM ACUTE RADIATION SICKNESS
B. I. Davydov et al *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 427–436 refs (See N69-38701 23-05)
Avail: CFSTI CSCL 06R

The function of the thyroid gland was examined in experiments on dogs by using the accumulation and excretion of I^{131}. The cholinesterase activity in the anterior and posterior regions of the hypothalamus, thalmus, paleocortex, archeocortex, neocortex, and cerebellum was also examined. A decrease in the accumulation of I^{131} in the dogs within 14 months after irradiation with a dose

of 400 r was accompanied by a decrease in the cholinesterase activity in the hypothalamus and thalamus. A determination of the correlation coefficient according to Spearman's formula showed that the most rigid relationship ($p = +0.95$) is found between the accumulation of I^{131} and the cholinesterase activity in the hypothalamus. Author

N69-38748*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.
RATE OF POST-RADIATIONAL RECOVERY, WITH PARTIAL SHIELDING OF ORGANS IN THE ABDOMINAL CAVITY
V. I. Davydov et al *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 437–444 refs (See N69-38701 23-05)
Avail: CFSTI CSCL 06R

The period of half-recovery in mice and rats, with the upper part of the animal's body shielded, was determined by the method of repeated irradiation. The mass of shielded tissue was about 12% of the entire body mass, and the remanent dose beyond the shield was 3 5.5%. The half-recovery period for the protected animals was approximately three times less than for the controls. Author

N69-38749*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.
EXAMINING THE RBE OF PROTONS AND HEAVY IONS ON LYSOGENIC BACTERIA
Yu. G. Grigoryev et al *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 445–450 refs (See N69-38701 23-05)
Avail: CFSTI CSCL 06R

An examination was made of the relative biological effectiveness (RBE) of protons with energies of 630 and 100 MeV, and of accelerated carbon ions with energies of 36 MeV, on the lysogenic bacteria of the bacillus E. Coli (λ). It was established that the RBE coefficients for the protons of these energies, in relation to γ-rays from Co^{60}, vary within the limits of 0.9 to 1.0. The accelerated carbon ions have a more pronounced inducing effect. The RBE of the particles varied from 1.5 to 4.0, depending on the dose. The appearance of an oxygen effect was shown, as was the lack of any significant effect of the dose rate (from 0.3 to 35 rad/sec)of the proton radiation on the radiation-sensitivity of the bacteria which produce induced bacteriophages. Author

N69-38750*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.
THE DOSE-DEPENDENCE AND DYNAMICS OF THE PHYSIOLOGICAL REGENERATION OF THE EPITHELIUM IN THE CORNEAS OF MICE WHICH WERE SUBJECTED TO IRRADIATION BY PROTONS WITH AN ENERGY OF 630 MeV AND BY gamma-RADIATION FROM Co 60
V. M. Mastrukova et al *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 451–463 refs (See N69-38701 23-05)
Avail: CFSTI CSCL 06R

A comparison of the rate of recovery of mitotic activity, the level of chromosome aberations in the first mitosis, and the quantity of epithelial cells in the corneas of mice which were subjected to irradiation by γ-rays from Co^{60} and protons with an energy of 630 MeV showed that the values for the relative biological effectiveness (RBE), calculated on the basis of various criteria, differ substantially from one another, when using the rate of recovery of the mitotic activity as the criterion, the RBE value is equal to 1.1. At the same time, the RBE value calculated according to the maximum level for chromosome aberrations in the first mitosis is equal to 0.7 Author

N69-38751*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.
CYTOLOGICAL ANALYSIS OF THE DAMAGE TO THE INTESTINAL EPITHELIUM OF MICE WHICH WERE SUBJECTED TO IRRADIATION BY PROTONS WITH AN ENERGY OF 630 MeV
V. M. Mastryukova et al *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 464–472 refs (See N69-38701 23-05)
Avail: CFSTI CSCL 06R

The problem of the specific features of the effect of high-energy protons on radiation-sensitive tissues, particularly the epithelium of the duodenum, was examined. The examination is of definite interest from the point of view of the remote possibility of irradiation of the astronauts by proton radiation from solar flares. Author

N69-38752*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.
EVALUATION OF THE PERMISSIBLE DOSES FOR EXPOSURE TO IONIZING RADIATION ACCORDING TO THE CRITERION OF TOLERANCE TO EXTREME ACCELERATIONS
B. I. Davydov *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 473–488 refs (See N69-38701 23-05)
Avail: CFSTI CSCL 06R

The doses of irradiation for which the tolerance of the irradiated animals to acceleration was equal to the control were obtained by calculations. The doses of irradiation thus obtained were related to the post-radiation period by the hyperbolic function, $Dt = 5 \cdot 10^3$, where D is the dose of irradiation in rem; t is the time after the irradiation in days. For centrifuging repeated twice, this relationship could be approximated by an exponential function and represented by a regression equation Author

N69-38753*# Aztec School of Languages, Inc., Acton, Mass. Research Translations Div.
THE SURVIVAL RATE OF ANIMALS FOLLOWING GENERAL gamma-IRRADIATION WHILE SHIELDING THE ABDOMINAL REGION
B. L. Razgovorov et al *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 489–500 refs (See N69-38701 23-05)
Avail: CFSTI CSCL 06R

The effect of shielding sections of the tissues in the upper region of the abdomen on the increase in the radiation resistance of animals during a general γ-irradiation in lethal and super-lethal doses was examined in experiments on rats. For γ-radiation in doses of 1000-1650 r, the optimum width of the shield is 2 cm. The minimum thickness of a shield which ensures a high survival rate of the animals varies for various doses of irradiation: 5 cm for a dose of 100 r, 10 cm for a dose of 1500 r. In shielding parts of the upper region of the abdomen of rats by blocks with a width of 2 cm and a thickness of 15 cm. the factor for the decrease of the dose was about 2.4. Author

N69-38754*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.
CRITERIA FOR RADIATION SAFETY DURING PROLONGED SPACE FLIGHTS
Yu. G. Grigoryev et al *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 501–516 refs (See N69-38701 23-05)
Avail: CFSTI CSCL 06R

The criteria for determining the radiation danger of space flights are examined. It was shown that the selection of the criteria should be based on a consideration of the spectral composition and the type of cosmic radiation, as well as the degree of uniformity for the distribution of the absorbed dose. In planning protection from cosmic radiation, it is recommended that specially-analyzed norms for the possibility of irradiating the astronauts during the flight be used. Author

N69-38755*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.
THE PROBLEM OF DETERMINING THE PERMISSIBLE DOSE OF IONIZING RADIATION FOR THE CREW MEMBERS OF SPACECRAFT
Yu. G. Grigoryev et al *In its* Probl. of Space Biol., Vol. 6 Jul.

1969 p 517-531 refs Presented at the 16th Intern. Astronaut. Congr., Athens, 13-18 Sep. 1965 (See N69-38701 23-05)
Avail: CFSTI CSCL 06R

A number of aspects of the problem of determining the permissible dose of ionizing radiation for the crew of spacecraft are examined in this article. It is proposed that the following three levels of doses be regulated: the permissible dose (PD), the dose of warranted risk (DWR), and the critical dose (CD). It is shown that the values for these doses should vary for brief space flights and for longer-term and longer-range flights in space. On the basis of an analysis of the clinical observations, the authors consider that the PD, DWR, and CD for brief space flights are 15, 50, and 125 r, respectively. Author

N69-38757*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.
CLASSIFICATION OF THE ELECTROENCEPHALOGRAM OF A HEALTHY SUBJECT (IN RELATION TO THE PROBLEMS OF SELECTION IN AVIATION)
V. B. Malkin et al *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 540-554 refs (See N69-38701 23-05)
Avail: CFSTI CSCL 06L

On the basis of an analysis of 900 encephalographic curves recorded on young, healthy men, 5 types of EEG were classified. The classification was based on recordings made when the eyes were open or shut. In this case, the amplitude character of the EEG, the degree of expressivity, and the qualitative features of the α-rhythm, as well as the intensity of the slow and rapid components of the EEG, were considered. The significance of the orienting reaction was shown to be one of the most important factors determining the individual features of the EEG. The classification was intended for use in aviation and space medicine during dynamic observations of pilots and astronauts in the course of their practical activity. Author

N69-38758*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.
AN AUTOMATIC ANALYSIS OF DATA ON THE FUNCTION OF EXTERNAL RESPIRATION IN A HUMAN BEING
A. M. Zhdanov et al *In its* Probl. of Space Biol., Vol. 6 Jul. 1969 p 555-568 (See N69-38701 23-05)
Avail: CFSTI CSCL 05H

A method for an automatic analysis of the data on the function of external respiration in a human being is examined. A block-diagram of the algorithm and the results of the automatic analysis of the data on this function, using the M-12 electronic digital computer, are presented. According to the program developed, the output device writes out the numerical values for ten indices of the external respiration after each respiration cycle, and an additional two indices at the end of each minute. Author

N69-38759*# Aztec School of Languages, Inc., Acton, Mass. Research Translation Div.
CERTAIN PROBLEMS WITH REGARD TO THE USE OF ACCELETRONS (MECHANICALLY CONTROLLED VACUUM TUBES) IN DESIGNING MOVING SYSTEMS, AND THE PROSPECTS OF USING THEM IN MEDICINE
A. V. Yegorov *In its* Probl. in Space Biol., Vol. 6 Jul. 1969 p 569-577 refs (See N69-38701 23-05)
Avail: CFSTI CSCL 06L

The possibility of using acceletrons (mechanically controlled vacuum tubes) for recording various physiological functions is examined. Author

N69-38772# Federal Aviation Administration, Oklahoma City, Okla. Civil Aeromedical Inst.
EXPERIMENTAL IMPACT PROTECTION WITH ADVANCED RESTRAINT SYSTEMS: PRELIMINARY PRIMATE TESTS WITH AIR BAG AND INERTIA REEL/INVERTED Y YOKE TORSO HARNESS
Richard G. Snyder, Joseph W. Young and Clyde C. Snow Feb. 1969 23 p refs
(AM-69-4) Avail: CFSTI

Both the inverted-Y yoke torso harness with inertia reel and the air-bag restraint system have had extensive independent development for some time by several engineering and research organizations for both aviation and ground vehicle occupant protection. The first biomechanical primate evaluation of these concepts as experimentally adapted for possible automotive use is reported. These tests are a continuation of a study involving the relative impact protection and effectiveness of major restraint systems utilized in general aviation aircraft and in limited automotive use. The objective of this test series was to determine how much protection those advanced restraint concepts provided; to obtain preliminary biomechanical and physiological data; to identify problems of technique and applications in occupant protection; and to provide an initial basis for direction of future test requirements. Author

N69-38778*# Schwarz BioResearch, Inc., Orangeburg, N.Y.
EVALUATION OF THE LONG-TERM NUTRITIONAL POTENTIAL OF A CHEMICALLY DEFINED LIQUID DIET FOR SMALL PRIMATES Final Report, 1 Oct. 1968-31 Jan. 1969
Ralph Shapiro Jun. 1969 33 p refs
(Contract NASw-1754)
(NASA-CR-106103) Avail: CFSTI CSCL 06C

Whether a chemically defined liquid diet can serve as the sole source of water and basic nutrition for *Saimiri sciureus* (squirrel monkeys) was investigated. The long-term nutritional effects and potential were evaluated by lengthy feeding trials. For a period of 13 to 16 months, six squirrel monkeys were fed a 50% experimental diet while three monkeys were maintained on typical standard stock; calorie intake of the experimental group was 129 cal/day whereas the control group received 196 cal/day. After one year of the experimental diet, the same subjects were deprived of their *ad libitum* drinking water; the diet concentration was also reduced. The monkeys were observed to consume insufficient nutrient to compensate for the lowered diet concentration and the absent water supply. Autopsy results showed negligible effect on the hematopoietic system, but the animals were in generally poor physical condition, with smaller organ weights, alopecia and dehydration, and filiaris when compared to the sacrificed control group. M.H.E.

N69-38791*# Texas Univ., Houston. Dental Science Inst.
STUDY TO DEFINE AND VERIFY THE PERSONAL ORAL HYGIENE REQUIREMENTS FOR EXTENDED MANNED SPACE FLIGHT Annual Report, 1 Jul. 1968 30 Jun. 1969
Lee R. Brown, Merrill G. Wheatcroft, and Sandra Allen 30 Jun. 1969 59 p refs
(Contract NAS9-8200)
(NASA-CR-101933; AR-1) Avail: CFSTI CSCL 06P

Adequate and practical sampling methods have been developed to obtain a microbial census of intraoral tissues of humans and marmosets. These methods utilize wire loops to collect saliva and paper points to collect gingival sulcus fluid from humans and marmosets. The methods permit comparable assays of the predominating microorganisms in specific areas of the oral cavity of man and marmoset. The most suitable transport, diluting, and plating procedures for microbiological analysis of the specimens were determined. Preliminary base line counts of cultivable oral microorganisms from marmosets housed under ambient conditions were established. The counts were found to be quite similar to human counts. A relatively inexpensive hypobaric pressure chamber was fabricated which is suitable for studying the effects of simulated manned spacecraft environments on the oral health of marmosets. Author

N69-38821# Federal Aviation Agency, Oklahoma City, Okla. Civil Aeromedical Inst.
BINOCULAR FUSION TIME IN SLEEP-DEPRIVED SUBJECTS
C. E. Melton and Marlene Wicks Jan. 1969 7 p refs
(AM-69-1) Avail: CFSTI

The attainment of binocular single vision when the distance of gaze is changed is a component of total reaction time and may be critical in flight when the gaze is changed from the instrument panel to the outside or from the outside to the instrument panel. This report deals with the effect of fatigue induced by sleep deprivation on the binocular fusion reflex. Binocular fusion times were measured morning and evening in six subjects during 86 hours of sleep deprivation and in six control subjects. The binocular fusion reflex under the experimental conditions employed appeared to be resistant to fatigue incident to sleep-deprivation. Author

N69-38825# Federal Aviation Administration, Oklahoma City, Okla. Civil Aeromedical Inst.
PATHOLOGY OF TRAUMA ATTRIBUTED TO RESTRAINT SYSTEMS IN CRASH IMPACTS
Richard G. Snyder, Clyde C. Snow, Joseph W. Young, Warren M. Crosby, and G. Townley Price Feb. 1969 32 p refs
(AM-69-3) Avail: CFSTI

The types and severity of injuries attributed to such systems as the lap belt, 3-point harness, single diagonal belt, and double-torso harness, as well as an experimental double-torso inverted-Y yoke with inertia reel and an air bag restraint system were assessed in this study. Sixty experiments were conducted with Savannah baboons (papio cynoccphaws). Controlled experiments in a related series of studies considered a number of factors, including physical impact patterns typical of a commercial jet transport crash, the side-facing seat installation, and forward, rear, and side-facing light-aircraft and automotive impacts. One additional impact series investigated effects of seat belt restraint on pregnant maternal and fetal trauma. Both gross and microscopic examinations were conducted post-impact for acute trauma, and three cases of chronic survival injuries 30 days and 90 days post-impact are described. Trauma patterns distinctive of the various restraint systems are identified and described. Author

N69-38858# Oak Ridge National Lab., Tenn.
ANALYTICAL BIOCHEMISTRY
In its Anal. Chem. Div Dec. 1968 p 33–52 refs (See N69-38854 23-04)
Avail: CFSTI

Work on macromolecular separations and molecular anatomy continued with an analysis of transfer ribonucleic acids, the optimum conditions for the assay of tyrosine- and methionine-accepting RNA's, and a statistically designed program for optimization studies. Isotope dilution in conjunction with the standard aminoacylation method was used to determine subnanomole quantities of L-amino acids. Anion-exchange chromatography was applied to isolate and identify compounds separated from urine. Gel electrophoresis and centriphoresis were used to concentrate and isolate tumor antigen activity and to continue amino acid sequence analysis on mouse hemoglobins. Consideration of the frequency of certain substitutions in the β chain led to the conclusion that gene duplication is the primary cause of chain heterogeneity. G.G.

N69-38931# Oregon Univ., Eugene. Dept. of Psychology.
CODING SYSTEMS IN PERCEPTION AND COGNITION Semiannual Technical Report, 1 Jul. – 31 Dec. 1968
Ray Hyman Dec. 1968 47 p refs
(Contract F44620-67-C-0099; ARPA Order 966)
(AD-690595; AFOSR-69-1791TR) Avail: CFSTI CSCL 5/10

Methodology, hardware and technical competence were developed towards new problems. Some of these new problems include the role of imagery, the control systems of serial behavior, natural languages, the problem of meaning, decision processes, automated tasks, skilled performance in naturalistic settings, etc. Author (TAB)

N69-38936# Howard Univ., Washington, D.C. Dept. of Physiology.
EFFECTS OF ALTITUDE ON CELLULAR METABOLISM AND TERMINAL OXIDATION Annual Report, 15 Apr. 1968 – 14 Apr. 1969
Leslie C. Costello and Armand J. Gold Jun. 1969 16 p refs
(Contract DAHC19-68-G-0020)
(AD-690212; AR-1) Avail: CFSTI CSCL 6/19

The effects of high altitude exposure on cellular metabolism have not been clearly established. Of particular interest are the possible alterations in energy metabolism and oxidative pathways resulting from such exposure. The present report is concerned with some initial studies of the effects of altitude on mitochondrial activity. Rats were exposed to 0.5 atmosphere in an altitude chamber for 6-7 days. Such exposure resulted in a 25% increase in hematocrit readings. The animals lost weight as compared to controls. Altitude exposure resulted in a significant increase in plasma pyruvate values. Plasma citrate levels were not consistently altered. Such results indicated a physiological and biochemical response to the hypobaric exposure. Cytochrome c oxidase activity of mitochondria from liver, kidney, heart, and skelatal muscle was ascertained. The results to date indicate that cytochrome oxidase activity was not significantly altered. Author (TAB)

N69-39013# New Mexico Univ., Albuquerque.
PRIMATE ELECTROPHYSIOLOGY, PARTICULARLY RELATED TO SLEEP Final Report
John M. Rhodes Mar. 1969 76 p refs
(Contract AF 29(600)-5604)
(AD-689841; ARL-6571-TR-69-5) Avail: CFSTI CSCL 6/16

In a series of studies evaluating sleep in lower primates it was possible to demonstrate that sleep staging criteria are more similar to humans than lower animals. However, within the primate scale the lower primates have shorter stages as well as interspecies differences. These interspecies differences suggest the possibility of studying specific stages more advantageable in one species than another. From the definition of primate sleep similarities it was possible to study sleep deprivation effects. The deprivation effects are similar to man at the extreme level, that is deep sleep (Stage 4 and paradoxical) is the first to recover and is most necessary for recovery of basic function. However, the evidence was highly suggestive that the recovery of lighter sleep stages (particularly Stage 2) was related to recovery of a subjective sense of well-being. This latter aspect would appear to be most crucial for the return of good decision making. In other studies investigating electrical activity of the lower primate brain under conditions of rapid decompression it was found that EEG correlates were early prognosticators of a return to performance. It was also possible to identify, in the chimpanzee, an electrical rhythm recordable from the uncus that seemed to be related to the emotional significance of an odor. Other work covered describes how cortical temperature differs from lower primates to lower mammals, evoked response differences within different primate species, biochemical differences between parenteral and ventrical injections. Author (TAB)

N69-39023 Michigan Univ., Ann Arbor.
HUMAN BIOTHERMAL STRAIN IN RELATION TO ENVIRONMENTAL STRESS PARAMETERS
Jack Edwin Peterson (Ph.D. Thesis) 1968 207 p
Avail: Univ. Microfilms: HC $9.45/Microfilm $3.00 Order No. 69-2369

Two subjects (the main series) were exposed to thiry-three combinations of environmental heat stress parameters, while two other subjects (the secondary series) were exposed to eight. For the main series, the following parameter levels were used: air temperature (t_a), 75, 95, and 115 F; water vapor pressure in air (P_a), 10 and 20 mm Hg; air velocity (V), 75 and 120 ft/min; metabolic rate corrected for respiratory and external work losses (M*), 531, 690, and 907 BTU/hr. For the secondary series, levels

were: t_a, 75 and 95 F; P_a, 10 and 20 mm Hg; V, 120 ft/min; M*', 531, 907, 1548, and 2190 BTU/hr. Sweat rate was the response best correlated with stress (best r =0.97), followed by ear temperature, rectal-to-skin conductance, rectal temperature, skin temperature, ear-to-skin conductance, heart rate, and duration of systole (best r =0.79). All other measures of response were less well correlated. Dissert. Abstr.

N69-39031# RAND Corp., Santa Monica, Calif.
THE INFORMATION THEORY ASPECT OF TELEPATHY
I. M. Kogan Jul. 1969 26 p refs Transl. into ENGLISH from Russian Conf. Paper Presented at Symp. on A New Look At Extrasensory Perception, Los Angeles, 7 –8 Jun. 1969
(AD-691231; P-4145) Avail: CFSTI CSCL 5/10

The purpose of the paper is to show the consistency of the results of telepathic experiments and some well-known ideas about nature. The possibility of obtaining definite results by intentionally conducted experiments speaks in favor of the existence of the telepathic type of phenomena. Formalized algorithms permit in perspective the use of telepathy for constructing information transmission channels. Author (TAB)

N69-39114# *Library of Congress, Washington, D.C.* Aerospace Technology Div.
SOME CHARACTERISTIC TRENDS IN RECENT SOVIET STUDIES OF ENERGY TRANSFER IN THE PRIMARY PHOTOSYNTHESIS ACT
Boris Nartsissov *In its* Foreign Sci. Bull., Vol. 5, No. 8 Aug. 1969 p 1 –13 refs (See N69-39113 23-34)
Avail: Issuing Activity

A review is made of the latest Soviet investigations of the primary photosynthesis act, namely, electron or proton transfer to and from the photoexcited pigment, redox reactions of the pigments and the role of water (source of the photosynthetically evolving oxygen) in the association of chlorophyll. The studies seem to be aimed at the reproduction of photosynthesis in vitro. Author

N69-39137# Bhabha Atomic Research Centre, Bombay (India). Biology Div.
INVESTIGATIONS ON BASIC MECHANISMS OF RADIOSENSITISATION BY CHEMICALS Progress Report, 15 Jul. 1968 –15 Jan. 1969
B. B. Singh, V. T. Srinivasan, B. Y. Bhatt, D. S. Joshi, M. A. Shenoy et al 1969 21 p refs
(Contract IAEA-578/RI/RB)
(BARC-392; PR-2) Avail: CFSTI

Iodoacetic acid, vitamin K_5, and its degradation products caused radiosensitization of *E. coli* and *Staphylococcus aureus* cells under oxic as well as anoxic conditions. The sensitization was produced due to some short-lived transients of the sensitizers which were formed by the reaction of radiolytically induced hydroxyl radicals. Although the transients responsible for radiosensitization by vitamin K_5 could not be identified, iodine atoms were shown to be involved in the process of sensitization by iodoacetic acid. Using I^{131}-labelled sensitizer, radioactivity was found to be associated mainly with the membrane proteins of *E. coli B/r* cells. Similar observations could not, however, be made on *Staph-aureus* cells. As membranes are believed to be the site for the various enzymes responsible for cell metabolism, iodination of such proteins would lead to their inactivation. The inactivation of some respiratory enzymes residing in the *E. coli B/r* membrane was, therefore, investigated with a view to study the sensitizing effect of iodoacetic acid. Author

N69-39180# School of Aerospace Medicine, Brooks AFB, Tex.
EFFECTS OF PH, CO SUB 2, AND BUFFERING SYSTEMS ON LACTIC ACID PRODUCTION IN RAT LIVER SLICES
Final Report, Dec. 1966 –Mar. 1968
William G. Soucie Apr. 1969 12 p refs
(AD-690303; SAM-TR-69-21) Avail: CFSTI CSCL 6/16

In an effort to reveal the separate effects of pH, CO2, and the type of buffering agent on lactate production, rat liver slices were incubated in Krebs-Ringer solution using three different buffers equilibrated with either O2 or 5% CO2 in O2 and at three different pH values (7.1, 7.4, 7.7). With 5% CO2 in the gas phase, lactate production had a pH optimum of 7.4 in tris(hydroxymethyl)aminomethane (THAM) and phosphate buffer but when HCO3 was the sole buffer no pH optimum was evident in the range of pH 7.1 to pH 7.7. Optimal lactate production was shifted from pH 7.4 to pH 7.7 or higher when 100% O2 was the equilibrating gas for THAM buffer. In general, the presence of CO2 in the gas phase stimulated lactate production as compared to incubations in 100% O2. The rate of lactate production is dependent on the overall rate of glycolysis. Recent evidence indicates that phosphofructokinase is an important glycolytic rate-limiting enzyme and that the direct or indirect involvement of PCO2 and pH with phosphofructokinase activity seems highly probable. Author (TAB)

N69-39183*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
APPLICATION OF HUMAN TRANSFER FUNCTIONS TO SYSTEM ANALYSIS
James J. Adams and Maxwell W. Goode Washington Oct. 1969 32 p refs
(NASA-TN-D-5478; L-6382) Avail: CFSTI CSCL 05E

An analytical study was made of a full-scale, manually controlled lunar landing simulator by using analytical transfer functions for the pilot control response along with the analytical representation for the mechanisms. The results of this study show that some of the dynamic characteristics of the simulator were in a range to influence the response of the manually controlled systems that were to be tested. Tests were made in which the dynamic response of the simulator was varied over a limited range of characteristics. The results confirm the conclusion of the analytical study in that the change did influence the piloted response. Author

N69-39189*# Wayne State Univ., Detroit, Michigan. Center for Application of Sciences and Technology.
APPLYING NASA TECHNOLOGY TO AIR POLLUTION: THE SULFUR DIOXIDE PROBLEM, SECTION 2 Final Report
[1969] 27 p refs Revised Supersedes X69-14671
(Contract NSR-23-006-044)
(NASA-CR-100629) Avail: CFSTI CSCL 13B

After a broad review of the characteristics of the air pollution problem, the reduction of sulfur oxides from fuel oils, flue gases, and coal is discussed. The use of fuel cells and solid state devices in commercial electric power generation is considered. Technical and legislative solutions to the sulfur dioxide problem are explored along two lines: (1) the Kaldor Criterion, or net benefit to the system, with gains of one group offsetting losses of another group; and (2) the Pareto Optimality, i.e., no sacrifices on the part of anyone. As an example of (1), the liquefaction of coal for electric power generation is discussed; as an example of (2), the use of nuclear power plants for high-voltage dc power generation is mentioned. K.W.

N69-39199*# Little (Arthur D.), Inc., Cambridge, Mass.
DEVELOPMENT OF AN IMPROVED EXTRAVEHICULAR SPACE SUIT THERMAL INSULATION Final Report
David L. Richardson [1968] 153 p refs
(Contract NAS9-7519)
(NASA-CR-101948; C-69743) Avail: CFSTI CSCL 06K

Results are presented for the selection, screening, and experimental testing of a thermal micrometeoroid garment whose insulation and mechanical properties and non-flammability are substantially better than Gemini-type suits. The abrasive wear resistance of low-emittance aluminized surfaces of radiation shields was improved by overcoating the surfaces with 500Å of

vapor-deposited germanium. Effective shields were also obtained by applying gold to polyimide film, while all polymeric film materials tested are flammable in 16.2 psia oxygen. Conduction measurements showed that insulation fabrication techniques used for the Gemini space suit require modification to insure that the insulation layers are not load-bearing and hang loosely on the pressure-retaining layers of the space suit. Space chamber tests indicate the need for flexure endurance and heat loss simulation for all garments in order to prove their durability and thermal protection capability. Finally, a recommendation is made for the use of seven radiation shields and eight spacers in combination with internal and external garment layers as required for normal wear and micrometeoroid protection. A.C.R.

N69-39210*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ROTATING SPACE STATION STABILIZATION CRITERIA FOR ARTIFICIAL GRAVITY
Carl A. Larson Washington Oct. 1969 46 p refs
(NASA-TN-D-5426) Avail: CFSTI CSCL 06S

An understanding of man's dependency on a gravity field is an area where research has yielded limited results, thereby, prompting space station designers to include provisions for providing an artificial gravity field capability. A rotogravic environment, though satisfying certain of man's physiological requirements, can introduce other complicated requirements. Therefore, this investigation was devoted to obtaining, for space station designers, insight into how man's physiological tolerances and range of adaptability can be used to define operational and configurational design criteria. Author

N69-39211*# Stanford Research Inst., Menlo Park, Calif.
CHARACTERISTICS OF THE TACTILE INFORMATION CHANNEL
J. C. Bliss, J. W. Hill, and B. M. Wilber Washington NASA Oct. 1969 181 p refs
(Contract NAS2-4582)
(NASA-CR-1389) Avail: CFSTI CSCL 06S

Experiments with multiple-point tactile and visual stimulus fields are described. A number of the experiments involved a brief presentation of between 2- and 12-point stimuli randomly distributed in a 3 by 8 matrix. The subject's task was to specify the location of each point stimulated in the entire matrix (whole report) or in the subset of the matrix indicated by a marker (partial report). In some of these latter experiments all stimulators were activated after the point stimuli, forming an erasure field which interfered with the perception of the stimuli. Analogous visual and tactile experiments were performed. The experiments with the erasure post-field indicated that information is transferred in parallel, rather than sequentially, to higher centers. A model for both visual and tactile information processing is proposed. In another series of experiments the point stimuli were presented sequentially rather than simultaneously. The results indicated a strong dependence of the number of positions perceived in the correct spatial location with a minimum occurring in the range of 50 to 100 ms. Author

N69-39212*# Honeywell, Inc., Lexington, Mass. Radiation Center.
LABORATORY OCULOMETER
John Merchant Washington NASA Oct. 1969 100 p refs
(Contract NAS12-531)
(NASA-CR-1422) Avail: CFSTI CSCL 06B

The oculometer is an electro-optical device that measures the direction of pointing of the human eye. It is not attached to the subject, and operates with essentially invisible infrared radiation. The oculometer can find application in cases where eye direction is to be measured with a minimum of interference to the subject for: (1) psychological and physiological monitoring; and (2) eye control, that is the direct control of target acquisition/tracking systems by oculometer signals defining the direction of pointing of operator's eye. Author

N69-39277 Brandeis Univ., Waltham, Mass.
STAGES OF PROCESSING IN VISUAL SEARCH
Henry Kalman Beller (Ph.D. Thesis) 1968 118 p
Avail: Univ. Microfilms HC $5.80/Microfilm $3.00 Order No. 69-2045

A model of human pattern recognition is tested and empirical information about human performance in pattern recognition is obtained. The proposed model consists of two independent sequential stages of processing, preattentive and focal attentive. The former is responsible for isolating and maintaining the next object of attention. The latter is responsible for identifying the presented object. The two stages were proposed to operate upon distinct, independent classes of information. The irrelevant class of information is sufficient to elicit attention but not necessarily sufficient to enable object identification. The relevant class of information is sufficient to enable object identification but not necessarily sufficient to elicit attention. It was hypothesized that the time to process an irrelevant item would reflect preattentive processing and the time to process a relevant item would reflect focal attentive processing. Theoretical considerations led to three hypotheses, and a visual search experiment was designed and performed to test the hypotheses. Dissert. Abstr.

N69-39385 Washington Univ., St. Louis, Mo.
INTERACTIONS BETWEEN BLUE-GREEN ALGAE AND HEAVY METALS
Arthur Bambridge Sparling (Ph.D. Thesis) 1968 116 p
Avail: Univ. Microfilms: HC $5.80/Microfilm $3.00 Order No. 69-2445

A laboratory study was carried out to investigate some of the interactions between certain heavy metals and selected blue-green algae in water. The metals used were copper, zinc, cadmium, and nickel in concentrations ranging from 0.5 to 10 mg/l initially. Four genera of blue-green algae were represented: Nostoc, Anacystis, Gleocapsa, and Merismopedia. Comparison of the DNA concentration as a parameter to some of the more commonly used control parameters for activated sludge units, indicates that the DNA concentration does fluctuate in almost the same manner as the mixed liquor volatile suspended solid. The utility of using the DNA concentration in aerobic systems for this purpose is doubtful. Investigation of the relationship of DNA content per unit of mixed liquor volatile suspended solids to the sludge volume index indicated that there is no definite relation between the DNA content and the phenomenon of sludge bulking. Dissert. Abstr.

N69-39431# Royal Air Force, Farnborough (England). Inst. of Aviation Medicine.
A COMPARATIVE EVALUATION OF THE RESTRAINT AFFORDED BY THE PRESENT AND TWO MODIFIED COMBINED HARNESSES FOR THE GNAT TRAINER AT HIGH FORWARD AND VERTICAL ACCELERATION
D. C. Reader Dec. 1968 22 p refs
(FPRC/MEMO-245) Avail: CFSTI

The harness for the Gnat Trainer at present in service and two alternative combined harnesses were evaluated at high forward and vertical accelerations. Tests involving high forward acceleration showed little difference in restraint but more discomfort with the alternative harnesses. Vertical acceleration tests showed both improvement in parachute suspension position and comfort with the alternative harnesses. Some features of the alternative harnesses are recommended for inclusion in replacement Gnat harnesses to be used with the XA type Personal Survival Pack. Author

N69-39435# Army Foreign Science and Technology Center, Washington, D.C.
LABORATORY INVESTIGATIONS OF ANTI-CORROSION PROPERTIES OF GREASES CONTAMINATED WITH FUNGI
V. N. Shaposhnikov et al 17 Jun. 1969 11 p Transl. into ENGLISH from Nauchn. Dokl. Vysshei Shkoly, Biol. Nauki (Moscow).

v. 11, no. 7, 1968
(AD-690377; FSTC-HT-23-240-69) Avail: CFSTI CSCL 13/8

The protective properties of various greases contaminated with fungi were tested on metal plates. Greased metal plates were inoculated with spores of a mixture of fungi and placed in a desiccator under conditions of 100% relative humidity at 28-30 deg. Control plates were not contaminated with spores. Growth of fungus colonies was observed after 80 days, but no corrosion was detected even after 160 days on either the experimental or control plates. After 240 days, corrosion was observed under certain greases. This method is recommended for testing the stability of greases to microorganisms in preference to the use of auger media in Petri dishes. Author (TAB)

N69-39548# Flying Personnal Research Committee, London, (England).
A STUDY OF THE RHYTHMS IN A DOUBLE CREW, FIVE DAY CONTINUOUS DUTY OPERATION
D. W. Atkinson, R. G. Borland, and A. N. Nicholson Dec. 1968 16 p
(FPRC/1282) Avail: CFSTI

The sleep rhythms of aircrew, during a double crew continuous duty operation of approximately 110 hours duration, are studied in a Belfast aircraft of Air Support Command on a journey to and from FEAF. Author

N69-39549# Royal Air Force, Farnborough (England). Inst. of Aviation Medicine.
AN APPROACH TO THE PROBLEM OF BACKACHE IN AIRCREW
J. G. Fitzgerald Sep. 1968 20 p refs
(FPRC/1280) Avail: CFSTI

The incidence of low backache among aircrew is abnormally high. Long hours of uninterrupted sitting, tight torso harness and inadequate back support impose abnormal strains and stresses which cause structurally normal spines to function improperly. The probability that this type of prolonged, repeated stressing is well in excess of what might be considered as 'fair wear and tear' is discussed and new methods of minimizing these stresses are described. Author

N69-39550# Ministry of Defence, London (England). Flying Personnel Research Committee.
AN INVESTIGATION OF SOME FACTORS CONTRIBUTING TO INDIVIDUAL VARIATION IN MOTION SICKNESS SUSCEPTIBILITY
J. T. Reason (Leicester Univ.) Mar. 1968 43 p refs
(FPRC/1277) Avail: CFSTI

The results of a survey of motion sickness incidence are discussed. These show that women are more liable to motion sickness than men and that in both sexes there is a significant tendency for reported incidence to decline with age. The results of a comparison of perceptual and sensory measures in two groups of subjects suggest that individuals vary characteristically in the extent to which the central nervous system transduces stimulus energy. This type of variation is also seen as partly responsible for the individual differences in motion sickness susceptibility. The wider implications of the concept of receptivity are also discussed. Author

N69-39563# Royal Air Force, Farnborough (England). Inst. of Aviation Medicine.
AN EVALUATION OF THE RESTRAINT AFFORDED BY A MODIFIED AEW GANNET UNDERWATER ESCAPE HARNESS AT HIGH FORWARD AND VERTICAL ACCELERATION
D. C. Reader and E. P. Beck Sep. 1968 21 p refs
(FPRC/MEMO-242) Avail: CFSTI

Experiments at high forward and vertical acceleration were conducted to examine the restraint of the Gannet underwater escape harness under the conditions of crash deceleration and parachute development respectively. The restraint to forward acceleration was found to be inadequate and the harness was uncomfortable under vertical acceleration. Recommendations are proposed to make the harness safe and comfortable for flight. Supplementary recommendations and a strapping-in procedure are listed. Author

N69-39570# Technology, Inc., Dayton, Ohio.
DEVELOPMENT OF A DYNAMIC MODEL OF UNRESTRAINED SEATED MAN SUBJECTED TO IMPACT Final Technical Report, 20 Nov. 1967 – 19 Jan. 1969
Robert R. Yeager, Gerald V. Machowsky, and Robert J. Shanahan Mar. 1969 94 p refs
(Contract N00156-68-C-0302)
(AD-691222; TI-00242-69-6; NADC-AC-6902) Avail: CFSTI CSCL 5/5

Analytical models were developed to duplicate through computer techniques the responses of human personnel subjected to several decelerational environments produced by dropping a seat-man assembly within a vertical drop tower. To this end, a mathematical model was constructed to simulate the response of the test seat. Comparison of computed curves derived from the analytical models with measured curves based on drop test data showed agreement for 7 G peak deceleration environments. Nonlinearities were developed for the nonlinear critical damping ratio for deceleration levels below 7 Gs. Author (TAB)

N69-39586# New York Univ., N.Y. Medical Center.
IN VIVO MEASUREMENTS OF NUCLIDES EMITTING SOFT PENETRATING RADIATIONS Final Report
G. R. Laurer and Merril Eisenbud 13 Jun. 1969 48 p refs
(Contract DA-49-193-MD-2962)
(AD-690243) Avail: CFSTI CSCL 6/18

This report presents the results of experiments utilizing a 1 mm thick CsI(Tl) crystal in conjunction with a NaI(Tl) crystal anti-coincidence system for the quantitative in vivo assessment of body burdens of low energy photon emitters such as 239Pu, 90Sr, 210Pb and natural and enriched uranium. Measurements done to obtain optimum crystal thickness have shown a thickness of 1 mm to be a practical compromise for all three nuclides. The use of this thin crystal in conjunction with a NaI(Tl) crystal anti-coincidence system using rise-time discrimination is effective in reducing background in the low energy region by approximately 60%, and the Compton continuum of 137Cs by as much as 70%. The use of this system has led to the development of a prototype, portable in vivo counter with an 8 inch diameter by 1 mm thick CsI(Tl) detection crystal and an 8 inch diameter by 2 inch thick NaI(Tl) anti-coincidence crystal. The crystals are mounted in a moveable rig which allows movement in the X, Y, and Z planes. The entire rig, including electronic apparatus - without a multichannel analyzer - weighs on the order of 200 lbs. Calibration measurements performed with the large crystal have shown minimum significant measurable levels of activity (MSAs) which indicate that body burdens, more particularly lung burdens, may be measured at a fraction of the Maximum Permissible Body Burden without the use of a steel room. Author (TAB)

N69-39631# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
DEVELOPMENT OF HUMAN DESCRIBING FUNCTION MODELS FOR NONLINEAR CONTROL ELEMENTS
James T. Mannen (M.S. Thesis) and Leon C. Duggar (M.S. Thesis) Mar. 1969 145 p refs
(AD-691207; GE/EE/69-6) Avail: CFSTI CSCL 1/3

The purpose of the thesis is twofold. First, the usefulness of human pilot describing function models in nonlinear control systems was to be experimentally determined. Secondly, parameter

adjustment rules which would extend the usefulness of the describing function models into the nonlinear region of operation were determined. The approach to this problem was to operate a pilot model and human tracker control system simultaneously with the same inputs and compare the performance of the two systems as nonlinear elements were introduced. Gaussian nonlinear describing function theory and existing pilot adjustment rules were used to predict model parameter adjustment changes as the level of saturation of the nonlinear elements were decreased. Where these prediction techniques failed, the necessary adjustment rules were experimentally determined. Saturation of the nonlinear elements were decreased. Where these prediction techniques failed, the necessary adjustment rules were experimentally determined. Saturation limiting and rate limiting were the nonlinearities employed with three controlled element characteristics. Author (TAB)

N69-39633*# Techtran Corp., Glen Burnie, Md.
INVESTIGATIONS OF SUGAR METABOLISM IN HUMANS. PART 1: THE REACTION OF BLOOD SUGAR TO THE PERORAL SUPPLY OF A SMALL DOSE OF GLUCOSE [UNTERSUCHUNGEN UEBER DEN ZUCKERSTOFFWECHSEL DES MENSCHEN. 1. MITTEILUNG: UEBER DAS VERHALTEN DES BLUTZUCKERS NACH PERORALER ZUFUHR KLEINER GLUKOSEMENGEN]
H. Staub Washington NASA Sep. 1969 18 p refs Transl. into ENGLISH from Z. Klin. Med. (Heidelberg), v. 91, 1921 p 44–60
(Contract NASw-1695)
(NASA-TT-F-12472) Avail: CFSTI CSCL 06P

It is demonstrated that small doses of glucose elevate blood sugar level in a clearly evident manner. The blood sugar curve following ingestion of 20 g of glucose is suggested as a standard functional check of sugar metabolism. Care must be taken to see that test conditions are identical for comparability. Author

N69-39698# TRW Systems Group, Redondo Beach, Calif.
RESEARCH ON THE SYNTHESIS OF OXYGEN BY A PHYSICOCHEMICAL SYSTEM Final Report, Apr. 1967–Feb. 1968
Norman Weliky, Nord L. Gale, Robert J. Day, and Herbert P. Silverman Wright-Patterson AFB, Ohio AMRL Feb. 1969 73 p refs
(Contract F33615-67-C-1506)
(AD-691030; TRW-08475-6001-R0-00; AMRL-TR-68-56) Avail: CFSTI CSCL 6/1

Where space, weight, and power limitations are of major importance, photosynthesis is an inefficient process for providing the energy for the production of food and oxygen. The assimilation of carbon dioxide into food materials by green plants requires two important factors commonly provided by the photosynthetic process, adenosine triphosphate (ATP) and reduced triphosphopyridine nucleotide (TPNH). We have demonstrated that oxygen as well as enzymatically active TPNH can be generated by an electrochemical system which employs the mediating agents: methyl viologen and ferredoxin-TPN-reductase. This system has been shown to stimulate TPNH-dependent fixation of carbon dioxide. It is recommended that further study be performed to allow greater understanding and definition of the system and its components, and to explore the possibility of producing ATP within the electrochemical cell. Author (TAB)

N69-39730# School of Aerospace Medicine, Brooks AFB, Tex.
STANDARDIZATION OF AVIATION NOISE STRESS
I. Ya. Borschevskii et al 1969 8 p Transl. into ENGLISH from Voenno-Med. Zh. (Moscow), No. 10, Oct. 1967 p 80–82
(AD-691053; SAM-TT-R-1001-0169) Avail: CFSTI CSCL 6/19

The studies performed concerning the cumulative effects of noise lead to the following recommended maximum tolerable levels of noise relative to intensity and duration with daily exposure: up to 100 decibels--six hours, up to 110 decibels--one hour, 115 decibels--not more than 30 minutes. These criteria bear reference to individuals exposed to noise without the use of individual protective devices. When the latter are used, the allowable levels of noise may be correspondingly increased by ten decibels. Author (TAB)

N69-39737*# Aztec School of Languages, Inc., Maynard, Mass. Research Translation Div.
THE PERIODIC MOVEMENTS OF PRIMARY LEAVES OF CANAVALIA ENSIFORMIS. CHAPTER 4: CLINOSTATIC TESTS [DE PERIODIEKE BEWEGINGEN VAN DE PRIMAIRE BLADEREN BIJ CANAVALIA ENSIFORMIS. HOOFDSTUK 4: KLINOSTAATPROEVEN]
G. Brouwer Sep. 1969 3 p refs Transl. into ENGLISH from a Netherlands Ph.D. Thesis, Utrecht, 1926 p 102–103
(Contract NASw-1692)
(NASA-TT-F-12609) Avail: CFSTI CSCL 06C

The motions of the leaves during inversion and rotation of the plant while placed on a clinostat are briefly described, particularly the movement of the leaves with respect to the plant and light sources. The behavior is compared with that of other plants, such as *Phaseolus.* Author

N69-39853# Cambridge Univ. (England). Dept. of Pathology.
THE MECHANISM WHEREBY PEPTONE FRACTIONS AFFORD PROTECTION AGAINST FREEZE-THAW INJURY TO CELL MEMBRANE Final Scientific Report, 1 Apr. 1968–31 Mar. 1969
Ronald I. N. Greaves, J. Desmond Davies, and Peter R. M. Steele 31 Mar. 1969 38 p refs
(Contract F61052-68-C-0041)
(AD-691218) Avail: CFSTI CSCL 6/1

From the results of a series of experiments on the effects of cooling and thawing on a range of micro-organisms and human red cells it would appear that there are certain fundamental consequences of cooling and freezing on lipo-protein membranes common to all cells. Ionic damage with the possible weakening of hydrophobic bonds and the resulting destabilization of macromolecular configuration is thought to be a primary cause of damage on cooling to temperatures above the eutectic temperature of the medium and can be prevented by the presence of compounds which promote structure formation within water, e.g. phosphates, acetates, glycerol and peptides. Below the eutectic temperature peptide protection seems to be more specific and may act either by altering the permeability of the cell membrane and so prevent the formation of intracellular ice or alternatively the peptides may act by a direct substitution within the membranes and so prevent cross linkage between active groups which could lead to the destruction of the cell on thawing. Author (TAB)

N69-39894# Royal Air Force, Farnborough (England).
THE EFFECT OF RED AND WHITE INSTRUMENTS LIGHTING ON THE DARK ADAPTATION INDEX, PART 2
T. C. D. Whiteside and A. Mercier (French Air Force) Jan. 1969 8 p refs
(FPRC/1283) Avail: CFSTI

When the markings on an instrument panel are illuminated by white instead of red light, there is some loss of night vision. The loss of night vision corresponds to the level of dark adaptation which is attained after 18 minutes of darkness instead of 22 minutes. It is therefore, in practical terms, of little importance. Since the different operational roles need varying degrees of night vision, and also since individuals have special preferences, it is suggested that the experimental findings justify the following recommendations: that all aircraft instruments be illuminated by white light under variable control, and that flood lighting should be either white or red according to preference, and again under variable control. Author

N69-39899*# Naval Aerospace Medical Inst., Pensacola, Fla. Aerospace Medical Center.
THE EFFECT OF VARYING THE TIME INTERVAL BETWEEN EQUAL AND OPPOSITE CORIOLIS ACCELERATIONS
James T. Reason and Ashton Graybiel 16 Jul. 1969 16 p refs
(NASA Order R-93)
(NASA-CR-106216; NAMI-1080) Avail: CFSTI CSCL 06S

The effect of varying the time interval between two equal and opposite coriolis accelerations on the duration of the subjective responses evoked by the second stimulus are investigated, and predictions generated from a torsion pendulum model of the neural events mediating these subjective phenomena are evaluated. Theoretical curves derived from the torsion pendulum model approximated closely the way in which the reported durations of the subjective phenomena increased as a function of the time interval between the two Coriolis accelerations. This result supported the a priori assumption that the neural events underlying the subjective phenomena are closely linked to mechanical events occurring within the cupula-endolymph system. However, an explanation resting entirely upon peripheral phenomena would be inadequate to account for two additional findings: (1) The estimated time constants of signal decay were shorter than those expected on the basis of the known mechanics of the semicircular canal system. (2) The persistence of the Coriolis sensation (feelings of apparent whole body motion without visual reference) was greater at all intervals than the Coriolis oculogyral illusion. Author

N69-39905# Royal Air Force, Farnborough (England).
A STUDY OF THE EFFECT OF CABIN ENVIRONMENT ON INSENSIBLE WATER LOSS
W. D. Macnamara (Can. Armed Forces) and A. N. Nicholson Mar. 1969 9 p refs
(FPRC/1287) Avail: CFSTI

The excretion of urine, during a period of four hours following a waterload of 1 litre, was observed in seven male subjects exposed to a normal office environment (control), a hot/dry (35°C 3 mmHg pH_2O) environment and a comfortable/dry (22°C 3 mmHg pH_2O) environment. The total urine volumes excreted during exposure to the hot/dry environment were considerably reduced compared with the control studies. The comfortable/dry environment had no detectable effect on the total volumes excreted. The physiological significance of the observations, their application to airline crews and the usefulness of the water-load test are discussed. Author

N69-39922# Navy Clothing and Textile Research Unit, Natick, Mass.
PHYSIOLOGICAL EVALUATION OF EFFECTS ON PERSONNEL WEARING THE MICROWAVE PROTECTIVE SUIT AND OVERGARMENT
D. A. Reins and R. A. Weiss Jul. 1969 32 p refs
(AD-690890; Rept-523-003-10) Avail: CFSTI CSCL 6/19

A silverized nylon, open-weave microwave protective suit and cotton twill overgarment, to be worn over conventional Navy work clothing, was developed to protect personnel working in the high-density radio frequency fields of the larger and more powerful radar scanning systems anticipated aboard Naval vessels and at shore installations. Since total body heat absorption per unit time is a critical factor for the survival of personnel exposed to a microwave field, a physiological evaluation of the protective clothing system was performed to determine if the clothing itself was responsible for any additional thermal stress in a warm environment. For a series of two-hour periods, two male subjects wearing this clothing in a climatic chamber were exposed to a temperature of 85 degrees F, a relative humidity of 45 percent, a wind velocity of 11.5 mph and a solar radiation of 1.6 gm-Cal/sq m/min. The protective clothing system did not place any significant physiological heat stress on personnel in the warm environment as compared to the wearing of conventional Naval work clothing alone. Visual acuity was decreased slightly. Author (TAB)

N69-39960*# California Univ., Berkeley. Dept. of Physiological Optics.
BIOLOGICAL CYBERNETICS
Lawrence Stark *In* NASA. Electron. Res. Center Future Fields of Control Appl. 1969 p 23-38 (See N69-39957 23-34)
Avail: CFSTI CSCL 06B

Two major aspects of bioengineering—the conceptual investigation of communication and control processes in biology through the systems approach, and the study of disease processes from a cybernetic point of view—are discussed and their scientific contributions identified. Neurological control mechanisms are considered most suitable for systems analysis, since they conform to such important requirements as unidirectional transmission between causally related lumped-parameter elements. The systems approach is then treated in relation to its interface with analytical physiology, both in the areas of physiological control mechanisms and in development of formal mathematical engineering models. The scientific aspects of medicine also benefit from these new techniques, since many diseases have pathophysiological mechanisms which can be classified as a loss of control in the proper operating interaction of a system of elements. Finally, developments in the field of bionics are highlighted, and the need for re-education in the health sciences as a result of the developments in bioengineering, biomathematics, and physics is emphasized. A.C.R.

N69-39996 National Lending Library for Science and Technology, Boston Spa (England).
WHICH KIND OF WEATHER MAKES BREATHING DIFFICULT?
V. F. Ovcarova 1 May 1969 23 p Transl. into ENGLISH from Priroda (Moscow), no. 8, p 28-33
(NLL-M-580-(9022.551)) Avail: Natl. Lending Library, Boston Spa, Engl.: .2 NLL Photocopy Coupons

An analysis of data on the density of oxygen in the atmosphere for Moscow and other areas of the Soviet Union is presented. Marked changes in the periodic and nonperiodic density changes of oxygen were noted. Results indicate oxygen density, climate, and weather changes are all connected with the difficulties of breathing, work capacity, and other minor ailments experienced by man and animal. E.H.W.

N69-40016*# Texas Womens Univ. Research Inst., Denton.
EFFECTS OF PROGRAMMED EXERCISE ON SKELETAL DENSITY AND CALCIUM BALANCE DURING HORIZONTAL BED REST OF HEALTHY ADULT HUMAN MALES
[1969] 214 p refs
(Contract NAS9-8246)
(NASA-CR-101958) Avail: CFSTI CSCL 06D

Regular exercise effects on the human skeleton and calcium, phosphorus, nitrogen, creatinine and creatine content during prolonged bed rest were examined. Statistical evaluation of various body function data showed that humans who exercised regularly excreted less calcium and phosphorus than those that did not exercise; bone density values supported this finding. Prolonged exercise-free bed rest also increased the nitrogen balance in the body. All subjects exhibited a significant increase ($P > 0.001$) of urinary creatinine and creatine in comparison with the pre-bed rest period, whether exercise was used or not. The pattern of a definite circadian rhythm was observed in the urinary calcium and nitrogen excretion during bed rest; this pattern was only slightly altered during a bed rest-exercise regime. G.G.

N69-40074*# General Dynamics/Convair, San Diego, Calif.
THE ORBITAL RESEARCH CENTRIFUGE: CONTINUED DESIGN AND FEASIBILITY STUDY Final Report
8 Jul. 1969 192 p refs
(Contract NAS1-8751)
(NASA-CR-66830; GDC-DCL-69-002) Avail: CFSTI CSCL 05E

A design oriented study examines the practicability of incorporating a relatively large passageway (up to 42 inch diam) through the hub area of an orbital research centrifuge. Details are presented of the configuration required for the evaluation of low-g inertial support for walking mobility, personal hygiene, and bench tasks as well as for performance of a wide range of experimental observation of human physiological response. Preliminary experiment descriptions, spacecraft integration data, performance requirements, and a detailed examination of the centrifuge and its systems are included. Author

N69-40089*# Research Triangle Inst., Durham, N.C.
BIOMEDICAL APPLICATIONS OF NASA SCIENCE AND TECHNOLOGY Quarterly Progress Report, 15 Dec. 1968 14 Mar. 1969
James N. Brown 14 Mar. 1969 103 p refs
(Contract NSR-34-004-056)
(NASA-CR-106344; RTI-EU-411; QPR-3) Avail: CFSTI CSCL 06B

Nine transferred applications concerned with the following are described: localized cooling of heart muscle; a biomedical tape recorder; oxygen content in ichthyological ovarian fluid; an improved EMG electrode for hand therapy; a therapy manipulator for abductor transfer cases; an improved blood vessel constrictor; an implantable valve with remote control from outside of the body; triggering methods from fixed reference point on the EKG waveform; and a simple means for sensing the respiratory function of humans. Five potential transfers are discussed: an electrode vest for EKG measurements; telemetry from wood ducks in natural environment; implantable pressure sensor and telemetry unit for fluid pressure measurement in cranial cavity; electromyography for hand rehabilitation; and an improved splintering material. Fifteen new problems are summarized, and progress with problems previously identified is discussed. Five computer searches and three current awareness searches were conducted in NASA aerospace literature. K.W.

N69-40147# General American Transportation Corp.,Niles, Ill. General American Research Div.
CARBON DIOXIDE REMOVAL SYSTEM OF THE REGENERABLE SOLID ADSORBENT TYPE
G. A. Remus, P. P. Nuccio, and R. J. Honegger Mar. 1969 57 p refs
(Contract AF 33(615)-1369)
(AD-690602; AMRL-TR-68-120; Rept-1253-8590) Avail: CFSTI CSCL 6/11

The development of a regenerable carbon dioxide removal system is discussed. The system utilizes solid zeolites to adsorb carbon dioxide and silica gel for predrying the gas stream. The system is completely regenerable, operates automatically and continuously, and provides for storage of the removed carbon dioxide. It is operable over a wide range of cabin environments and provides flexibility in varying the system operating parameters. It may be used to determine the thermodynamic requirements of a flight-type system for a particular cabin gas composition. The system can remove the carbon dioxide from four crewmen and maintain the carbon dioxide partial pressure between 4 and 5 mm Hg absolute at atmospheric pressure operation and between 6 and 7 mm Hg when operating at 350 mm Hg total pressure. It has this removal capacity when the cabin atmosphere is composed of 13 mm Hg water vapor partial pressure, 160 mm Hg oxygen partial pressure and either nitrogen or helium as the makeup gas. An external control console is provided which permits the system to be operated in an unmanned chamber. The system is not optimized for power and weight; as a laboratory model the total average power required is 4000 watts and the total weight including the mounting frame is 250 pounds. Author (TAB)

N69-40260# Joint Publications Research Service, Washington, D.C.
SPACE BIOLOGY AND MEDICINE
O. G. Gazenko *In its* USSR Achievements in Space Res. (1st Decade in Space, 1957 - 1967) 24 Jan. 1969 p 365 - 422 refs (See N69-40251 24-13)
Avail: CFSTI

Space biology is defined as an independent branch of biology concerned with three principal problems: (1) behavior of terrestrial organism in space (exophysiology); (2) existence, propagation, peculiarities, and evolution of living matter in the universe (exobiology); and (3) biological principles and methods for devising an artificial habitable medium in spacecraft (bioengineering, ecology of closed systems). The objectives of space medicine are listed, and exophysiology, ecology of closed systems, exobiology, some medical problems in supporting manned spaceflight, and biological research on rockets and spacecraft are discussed. It is concluded that improvements in space medicine and flight safety will make possible more complex flights of greater duration. F.O.S.

N69-40264 Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
NEUTRONS IN RADIOBIOLOGICAL EXPERIMENTS
B. M. Isaev et al Nov. 1968 296 p refs Transl. into ENGLISH of the book "Neitrony v Radiobiologicheskom Eksperimente" Moscow, 1967 p 1 292
(AD-691153; FTD-MT-24-258-68) Avail: CFSTI

The methodology of radio biological experiments using radioactive isotopes as neutron sources is discussed as are accelerators and reactors. The physical mechanisms of neutron interaction with biological objects, methods of measuring and calculating the absorbed doses, and are considered quality of irradiation, determined by its biological effectiveness is studied in detail. Measuring and calculating the distribution of absorbed doses according to line at energy loss is discussed. These parameters characterizing the interaction of radiation with the material must be considered during the formulation of qualitative radiobiological investigations. Author (TAB)

N69-40266# Litton Systems, Inc., Minneapolis, Minn. Applied Science Div.
INVESTIGATIONS OF HEAT AND MASS (WATER VAPOR AND LIQUID) MOVEMENT THROUGH CLOTHING SYSTEMS Final Report, 25 Jun. 1965 - 24 Jun. 1966
R. E. Larsen, L. W. Rust, A. R. Kydd, and G. A. Gauvin Sep. 1968 171 p refs
(Contract DA-19-129-AMC-683(N))
(AD-691144; USA-NLABS-C/OM-TR-69-31-CM-56) Avail: CFSTI CSCL 11/5

The report discusses research of the investigations of heat and mass (water vapor and liquid) movement through clothing systems and summarizes the results of a theoretical and experimental research program. Experimental studies included measurements of profiles of mean and fluctuating velocity, temperature, and water vapor concentration for various fabric spacings and ventilating velocities. Transfer coefficient data obtained from these profiles were compared with total water and heat loss rates. Author (TAB)

N69-40301*# George Washington Univ., Washington, D.C.
TECHNOLOGY ASSESSMENT
Raphael G. Kasper, ed. Jul. 1969 171 p refs Presented at the Seminar Ser., Program of Policy Studies in Sci. and Technol., Washington, D.C., Jan. - Apr. 1969 Sponsored by NASA
(NASA-CR-106302) Avail: CFSTI CSCL 05B

CONTENTS:

1. ASSESSMENT INFORMATION SYSTEMS C. H. Danhof p 1 - 20 refs (See N69-40302 24-34)
2. TECHNOLOGY ASSESSMENT AND THE CONGRESS R. A. Carpenter p 33 - 46 refs (See N69-40303 24-34)
3. THE ADVERSARY PROCESS IN TECHNOLOGY ASSESSMENT H. P. Green p 59 - 78 refs (See N69-40304

24-05)

4. THE MANAGEMENT OF TECHNOLOGY ASSESSMENT L. H. Mayo p 89–150 refs (See N69-40305 24-05)

N69-40304*# George Washington Univ., Washington, D.C.
THE ADVERSARY PROCESS IN TECHNOLOGY ASSESSMENT
Harold P. Green *In its* Technol. Assessment Jul. 1969 p 59–78 refs Sponsored by NASA (See N69-40301 24-05)
Avail: CFSTI CSCL 05B

The importance of introducing an adversary process, defined as a mechanism to permit articulation of negative facts related to a technological development, into the assessment procedure is stressed. Such a mechanism is required to identify and control the attributes of a technology which adversely affect basic individual rights that have traditionally been protected by the legal system; of particular concern are those incidents which may threaten public health, safety, and security. Previous ad hoc attempts at creating an organization for this purpose are cited as failures, and it is proposed that there is a need for an agency charged solely with the function and responsibility to probe for negative factors, to identify them, and to press them vigorously upon the Congress and the public. It should be totally independent of the government or function as a part of the Congress. In this way, it is felt that the proponents of technology will be compelled to present their recommendations for development in a language comprehensible to the layman, and that the final decisions will be made through ordinary political processes. A.C.R.

N69-40305*# George Washington Univ., Washington, D.C.
THE MANAGEMENT OF TECHNOLOGY ASSESSMENT
Louis H. Mayo *In its* Technol. Assessment Jul. 1969 p 89–150 refs Sponsored by NASA (See N69-40301 24-05)
Avail: CFSTI CSCL 05B

The frequently advanced notion of a Total Problem Approach to technology assessment is discussed, and a tentative suggestion is offered for one type of institutional arrangement which might produce a close approximation to this goal. It is stressed that such an arrangement would supplement and coordinate the existing technology assessment function and would not supplant it. A brief overview is presented of past and current trends in the area of technology assessment and several major deficiencies are suggested The establishment of a neutral group of assessment centers is proposed as a first step for providing timely and reliable input into the final Congressional evaluation. The Total Problem approach would be used to monitor the performance of technology assessment systems relevant to each of the major techno-social problem areas, to recommend optimum social subsystems for interim assessments, to identify opportunities for applying technology to social problems, and to seek out and publicize existing or prospective detrimental impacts. A.C.R.

N69-40324*# National Aeronautics and Space Administration, Washington, D.C.
CONCENTRATION OF MATTER AND ACTION OF ENZYMES IN COACERVATES
T. N. Yevreinova Oct. 1969 223 p refs Transl. into ENGLISH of the book "Kontsentrirovaniye Veshchestv i Deystviye Fermentov v Koatservatkh" Moscow, Nauka Press, 1966 p 3–186
(NASA-TT-F-525) Avail: CFSTI CSCL 06C

The book brings together published data and the author's own experimental findings on coacervate systems consisting of compounds formed biogenically: proteins, nucleic acids, enzymes, carbohydrates, and other biopolymers and low molecular compounds included in the composition of living organisms. Most attention is given to the main property of coacervation, i.e., the concentration of compounds in individua coacervate drops both during their formation and during their absorption of substances, including enzymes, from the surrounding solution. It is shown that coacervate drops constitute very suitable models which can be used to elucidate and reproduce many of the phenomena characteristic of protoplasm, and to approach the solution of the most important problem in biology, the artifical synthesis of living matter. Author

N69-40328# Stanford Univ., Calif. Dept. of Computer Science.
STANFORD ARTIFICIAL INTELLIGENCE PROJECT
John Mc Carthy Jun. 1969 101 p refs
(Contract ARPA SD-183; ARPA Order-457)
(AD-691789; AI-MEMO-87) Avail: CFSTI CSCL 6/4

Plans and accomplishments of the Stanford Artificial Intelligence Project are reviewed in several areas including: theory (epistemology and mathematical theory of computation), visual perception and control (Hand-eye and Cart), speech recognition by computer, heuristics in machine learning and automatic deduction, models of cognitive processes (Heuristic DENDRAL, Language Research, and Higher Mental Functions). Author (TAB)

N69-40432# School of Aerospace Medicine, Brooks AFB, Tex.
BATTERY LIFE AND MOISTURE PENETRATION OF SUBDERMALLY IMPLANTED DEVICES Final Report, Mar. 1967–Mar. 1968
Henry Buchanan, Willis F. Moore, and Calvin R. Richter Jun. 1969 17 p refs
(AD-691348; SAM-TR-69-33) Avail: CFSTI CSCL 9/6

Tests were conducted to determine cause of relatively short and variable life spans of subdermally implanted electronic devices. The investigation was restricted to body fluid penetration of the epoxy case used for the implanted device and to operational life span of the power supply. Samples of the epoxy used for the implant cases were checked for rate of moisture absorption, and life tests were conducted on the power supply of the implant. The tests consisted of actual animal implantations and simulated implanted conditions in the laboratory. Results indicate the commercial epoxy used for the implant cases was imprevious to body fluids for the length of the test period. Cause of short and variable life span of implanted devices is attributed to the type of mercury batteries used. Author (TAB)

N69-40490# Naval Submarine Medical Center, Groton, Conn.
THE EFFECT ON PULMONARY FUNCTIONS OF RAPID COMPRESSION IN SATURATION EXCURSION DIVES TO 1000 FEET
James H. Dougherty, Jr. and Karl E. Schaefer 15 Mar. 1969 15 p refs
(AD-691368; SMRL-573) Avail: CFSTI CSCL 6/19

Four subjects were rapidly compressed at a rate of 2 - 3.5 feet per minute to 600 and 800-foot depths. They remained at saturation depths for 35 and 36 hours and carried out excursion dives lasting three hours to 800 and 1,000 feet, respectively. Maximal Expiratory Flow Rate (MEFR) and Maximal Inspiratory Flow Rate (MIFR) measured with a Wedge spirometer, at 200-foot increments during rapid compression showed a linear decrease with the increase in pressure. During the 35-36 hour saturation period, MEFR increased 33-35%; and MIFR rose 16-30% from the initial values obtained at saturation depths. The recovery of MEFR was not limited to peak flow rates, but also pronounced at the MEFR measured at 50% of vital capacity, indicating that the recovery was independent of musclar effort. Airway collapse during rapid compression and reopening during the subsequent saturation period is proposed as the most likely explanation for the observed changes. Vital capacity decreased during the compression and decompression period and showed a tendency to increase during the saturation period. Evidence of air-trapping was seen in flow-volume loops measured at depth. Author (TAB)

N69-40522# Systems Technology, Inc., Hawthorne, Calif.
RANDOM SAMPLING REMNANT THEORY APPLIED TO MANUAL CONTROL
Warren F. Clement Mar. 1969 116 p refs

(Contract N00014-68-C-0443)
(AD-691843; TM-183-A) Avail: CFSTI CSCL 5/8

The theory comprises stochastic finite-dwell sampling among displays with continuous control output based on cardinal reconstruction theory. Random sampling remnant theory introduces the notion of stability in the mean-square sense in the operators closed-loop tracking performance. A related regression of adopted crossover frequency is shown to be sensitive to the controllers sampling remnant. Foveal or parafoveal finite dwell sampling and intersample control output reconstruction suppress sampling remnant. A suppressed remnant will enable the operator to adopt ratios of sampling-to-crossover frequency more nearly approaching the lower bound predicted by the generalized sampling theorem. Two examples illustrate the practical application of the theory to displays for manual control. The influences of finite dwell and intersample reconstruction suggest that sampling remnant may offer a powerful practical measure for trading off the number and types of displays in a multiloop control situation. Author (TAB)

N69-40540# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

USE OF CONTINGENT STATUS INFORMATION IN DIAGNOSTIC PERFORMANCE AND RELATED ASPECTS FOR INFORMATION DESIGN, JANUARY - MAY 1967

Robert G. Mills Dec. 1968. 28 p refs
(AD-691806; AMRL-TR-68-135) Avail: CFSTI CSCL 5/8

The ability of observers to use stimulus relationships in making predictive or diagnostic decisions is investigated and implications of this area of research for application to man-machine systems are considered. Observers were required to make predictive estimates of the state of a system based on observations of sequentially presented qualitative subsystem status information. The status information was derived from four-cell contingency tables containing event frequencies and quantified by a correlation coefficient which varied from approximately 1.0 to -1.0. Results indicate: (a) that observers estimates appear to be based on the relative frequency of cell events as opposed to a correlation solution; (b) there is greater accuracy when estimates are based on positive relationships; and (c) observers are capable of only very gross discrimination between various levels of relationship. Conclusions generally considered how these results might be used in designing the information structure of man-machine systems such that an operators decision performance would be facilitated. Author (TAB)

N69-40550# Oregon State Univ., Corvallis. Dept. of Mathematics.

VISUAL ILLUSIONS OF ANGLE AS AN APPLICATION OF LIE TRANSFORMATION GROUPS

William C. Hoffman (Oakland Univ.) 1 Jul. 1969 35 p refs
(Contract N00014-67-A-0369)
(AD-691840) Avail: CFSTI CSCL 6/16

Visual illusions of angle are explained in terms of a calculus of visual constancies laid down earlier as misapplication of constancy. The rule is as follows: Identify the curves appearing in the visual illusion as orbits of the appropriate visual constancy (or constancies). Keep the Lie derivative that corresponds to the constancy whose orbit(s) appear distorted in the illusion, but replace the other by the Lie derivative orthogonal to it. Form a linear combination of the resulting two Lie derivatives, weighting the one that is kept the more strongly. This linear combination will generate the distorted portion of the illusion. TAB

N69-40603*# California Univ., Los Angeles. Space Biology Lab.

THE DESIGN AND CONSTRUCTION OF A THERMAL SYSTEM TO MEASURE SMALL TEMPERATURE CHANGES IN THE BRAIN

James G. McElligott 1969 6 p refs Presented at the 7th Temp. Meas. Soc. Conf., Hawthorne, Calif., 21 - 22 Apr. 1969
(Grant NGR-05-007-195)
(NASA-CR-106386) Avail: CFSTI CSCL 06P

A system is described by which small localized temperature changes can be measured in the brain. The system includes three types of probes: a thermistor - electrode probe, heated-thermistor probe, and a differential-thermistor probe. An ac compensating ratio bridge when used with a low noise/high gain amplifier linearizes the response of the thermistor over the temperature range used. It is possible to detect temperature changes as small as .0002°C with this system. Author

N69-40609# Naval Submarine Medical Center, Groton, Conn. Submarine Medical Research Lab.

COMPARISON OF SEVEN SYSTEMS FOR AIR CONDUCTION AUDIOMETRY FROM 8-20 KC/S

Cecil K. Myers and J. Donald Harris 18 Feb. 1969 19 p refs
(AD-6911367; SMRL-567) Avail: CFSTI CSCL 6/12

Seven equipment systems were assembled to study human auditory acuity from 8-20 kilocycles/sec. Twenty-eight ears were examined. Two loudspeakers and two earphones were utilized, two types of stimulus (pure tones and narrow bands of noise, and two psychometric methods (Limits and Adjustments)). All systems were capable of providing usably reliable thresholds throughout the whole frequency range. When objectively calibrated, several systems (those involving loudspeakers, as well as those involving earphones), yielded quite comparable reference threshold sound pressure levels as inferred at the eardrum. A slight preference was expressed for a system, the method of using Bekesy threshold-tracking, with a changing-frequency noise band 300 c/s in width, and for a discrete-tone system which uses the Method of Constants. Author (TAB)

N69-40621# Naval Submarine Medical Center, Groton, Conn. Submarine Medical Research Lab.

EFFECT ON VISION OF REPEATED EXPOSURE TO CARBON DIOXIDE Interim Report

Donald O. Weitzman, Jo Ann S. Kinney, and S. M. Luria 14 Feb. 1969 13 p refs
(AD-691402; SMRL-566) Avail: CFSTI CSCL 6/16

The visual effects of repeated exposure to CO2 at levels commonly regarded as innocuous were investigated. Exposure to CO2 varied cyclically from .03 (air) to 3.0%, at 1 atmosphere pressure, every 24 hours for a period of 6 days. A battery of visual tests was administered during this period and in control periods both before and after the CO2 exposure. Among the various tests, night vision sensitivity and color sensitivity for green were the only ones which repeatedly detected impairment of efficiency during the period of exposure. All other visual functions remained normal. Author (TAB)

N69-40624# Isomet Corp., Palisades Park, N.J.

A SOLID ELECTROLYTE CARBON DIOXIDE REDUCTION SYSTEM Final Report, Dec. 1967 - Sep. 1968

Horace W. Chandler and Lawrence J. Howell Apr. 1969 81 p refs
(Contract F33615-68-C-1173)
(AD-691844; AMRL-TR-68-177) Avail: CFSTI CSCL 6/11

An investigation of solid electrolyte cells utilizing a 90 mole % ZrO2-10 mole % Y2O3 electrolyte and platinum electrodes for the reduction of carbon dioxide to carbon monoxide and oxygen was carried out. At 1000 C, oxygen production efficiency is less than 50% when the cell is operated at a current density greater than 0.040 amp/cu cm on a dry CO/CO2 mixture as cathode feed. Reduction of the solid electrolyte because of insufficiently rapid transfer of oxygen from the cathode feed gas to the cathode is the direct cause of low current efficiency. Reduction of the electrolyte can lead to formation of a two-phase region in the electrolyte which can, in turn, result in permanent damage to the electrolyte. The presence of water vapor in the feed mixture of CO and CO2 decreases cell polarization, decreases electrolyte reduction and increases oxygen production efficiency. Author (TAB)

N69-40649# School of Aerospace Medicine, Brooks AFB, Tex. Radiobiology Div.

RADIOPROTECTION OF PRIMATES WITH 2-(1-DECYLAMINO, ETHANETHIOSULFURIC ACID IN DIMETHYL SULFOXIDE Final Report, May -Oct. 1968

Horace E. Hamilton, George S. Melville, Jr., and Emmett J. Stork Dec. 1968 18 p refs

(AD-691409; SAM-TR-68-137) Avail: CFSTI CSCL 6/15

Significant radioprotection of primates has been achieved by administering 2-(1-decylamino) ethanethiosulfuric acid, dissolved in dimethyl sulfoxide, intravenously to Macaca mulatta. Administered prior to whole body X-irradiation by a dose of 850 roentgens, this compound has resulted in fifty per cent survival, as compared to zero per cent survival of the placebo treated primates irradiated under identical conditions. Clinical chemistry and hematologic data were obtained preirradiation and on days one, three, and seven postirradiation for three groups of primates; protected and irradiated placebo treated and irradiated, and protected but sham-irradiated. Histopathology examinations were performed on the radiation non-survivors of both the protected and placebo treated animals, and on sacrificed drug controls and radiation survivors. Hematologic data, in the form of higher WBC and platelet values, provided evidence of protection of the lymphoid system. Author (TAB)

N69-40703# British Air Line Pilots Association, Hayes (England).

THE PILOT REQUIREMENT IN AUTOMATION, SIMULATION AND DATA HANDLING

H. A. Hopkins *In* Brit. Air Line Pilots Assoc. Automation, Simulation and Data Handling in Civil Aviation 1968 p 4-10 (See N69-40702 24-02)

Avail: CFSTI

In discussing the use of automation in the airline industry, emphasis is placed on the pilot-machine interface. Problem areas in computerized flight planning, air traffic control, and weather forecasting are briefly treated. Areas of greatest potential for the application of automated procedures are identified as air-ground communication systems, graphic navigation displays, and recording of engine and aircraft performance data for safety monitoring. The development of a special simulator for pre-production cockpit assessment is cited as a vital step toward insuring that the cockpit environment is matched to human limitations before the aircraft is put into commercial service. A.C.R.

N69-40762# Association Francaise pour l'Etude et le Développement des Applications de l'Energie Solaire, Paris.

USE OF SOLAR ENERGY FOR MASS CULTURE OF ALGAE [L'UTILISATION DE L'ENERGIE SOLAIRE PAR LES CULTURES ACCELEREES D'ALGUES]

1969 53 p refs In FRENCH Proc. of a Meeting of the Soc. Franc. des Thermiciens, Paris, 13 Feb. 1969

Avail: CFSTI

CONTENTS:

1. BIOLOGICAL PROBLEMS IN CULTURE OF ALGAE A. Moyse (Paris Univ.) 10 p (See N69-40763 24-04)
2. FOREIGN EXPERIMENTS FOR GROWING GREEN ALGAE G. Clément (Inst. Franc. du Pétrole) 12 p refs (See N69-40764 24-04)
3. FRENCH EXPERIMENTS: CULTURE OF SPIRULINE OR BLUE ALGAE H. van Landeghem 13 p (See N69-40765 24-04)
4. VALUE OF THE CROPS: QUANTITY, QUALITY, AND COST PRICE C. Meyer (Inst. Franc. du Pétrole) 6 p (See N69-40766 24-04)

N69-40763# Paris Univ., Orsay (France).

BIOLOGICAL PROBLEMS IN CULTURE OF ALGAE [LES PROBLEMES BIOLOGIQUES DES CULTURES D'ALGUES]

Alexis Moyse *In* Assoc. Franc. Etude et Dévelop. Appl. Energie Solaire Use of Solar Energy for Mass Culture of Algae 1969 10 p In FRENCH (See N69-40762 24-04)

Avail: CFSTI

The development and growth of chlorella are analyzed and it is shown that the growth curve is dependent on the medium in which the algae are grown. The importance of light in their development is stressed and the efficiency of the photosynthesis discussed. ESRO

N69-40764# Institut Francais du Pétrole, Paris (France).

FOREIGN EXPERIMENTS FOR GROWING GREEN ALGAE [LES REALISATIONS ETRANGERES: LES CULTURES D'ALGUES VERTES]

Geneviève Clément *In* Assoc. Franc. Etude et Dévelop. Appl. Energie Solaire Use of Solar Energy for Mass Culture of Algae 1969 12 p refs In FRENCH (See N69-40762 24-04)

Avail: CFSTI

Experimental work carried out at the Massachusetts Institute of Technology, in California, Japan, Czechoslovakia, Germany and Bulgaria for growing chlorella and scenedesmus are reviewed. ESRO

N69-40765# Institut Francais du Petrole, Paris (France).

FRENCH EXPERIMENTS: CULTURE OF SPIRULINE OR BLUE ALGAE [LES REALISATIONS FRANCAISES: LA CULTURE DE LA SPIRULINE, ALGUE BLEUE]

H. van Landeghem *In* Assoc. Franc. Etude et Dévelop. Appl. Energie Solaire Use of Solar Energy for Mass Culture of Algae 1969 13 p In FRENCH (See N69-40762 24-04)

Avail: CFSTI

Spiruline, an alga brought from the Chad region where it has been incorporated in the native diet for many years, has been test-grown in France and Mexico. The culture techniques are described and the results discussed. ESRO

N69-40766# Institut Francais du Pétrole, Paris (France).

VALUE OF THE CROPS: QUANTITY, QUALITY, AND COST PRICE [LA VALEUR DES RECOLTES: QUANTITE, QUALITE, PRIX DE REVIENT]

C. Meyer *In* Assoc. Franc. Etude et Dévelop. Appl. Energie Solaire Use of Solar Energy for Mass Culture of Algae 1969 15 p In FRENCH (See N69-40762 24-04)

Avail: CFSTI

The nutritional value and protein content of spirulines or blue algae are discussed and the cost of growing them artificially is estimated. ESRO

N69-40777*# McDonnell-Douglas Astronautics Co., Santa Monica, Calif. Advance Biotechnology and Power Dept.

EVALUATION OF DESORBATES FROM A REGENERATIVE CARBON DIOXIDE REMOVAL SYSTEM USED IN A 60-DAY MANNED TEST

P. P. Mader, M. L. Rodin, and R. A. Neustein Oct. 1969 35 p refs

(Contract NASw-1539)

(NASA-CR-106214; MDC-G1192) Avail: CFSTI CSCL 06K

Desorbates from silica gel and molecular sieve beds used as a part of a regenerative CO_2 removal unit in a life support system during a 60-day manned test were identified and quantified. The capacities of these two sorbers to adsorb and accumulate trace contaminants from the cabin atmosphere were compared. Material desorbed from activated charcoal of the toxin control subsystem was subjected to qualitative analysis. The results indicated that a significant amount of organic compounds was released from the silica gel and molecular sieve beds during the regenerative cycle. The daily reduction in organic contaminant level in the simulator (4,100-ft^3 volume) amounted to approximately 7.7 parts per million. The operation of the water recovery system inside the

space station simulator inadvertently led to the formation of sizable quantities of ammonia because of incomplete pretreatment of urine. It was effectively adsorbed by the silica gel sorbent beds. The silica gel unit helped remove the ammonia from the cabin at a faster rate than the water recovery post-treatment system could accomplish alone. Author

N69-40779*# Northrop Corporate Labs., Hawthorne, Calif.
DEVELOPMENT OF SUPPORT AND RESTRAINT TECHNOLOGY
W. A. Robbins, G. L. Potter, and C. F. Lombard Wright-Patterson AFB, Ohio AMRL Apr. 1969 96 p refs Supported in part by NASA
(Contract F33615-67-C-1651)
(NASA-CR-106384; AMRL-TR-68-136) Avail: CFSTI CSCL 06C

Guinea pigs were exposed to backward and forward facing ($\pm G_x$) and tail first ($+G_z$) impact accelerations in two types of support and restraint systems at entrance velocities of 40, 60, and 80 ft/sec. After exploratory experiments to determine the approximate 50% lethal G level (LD50), estimates of G levels for 40 and 60% mortality were made and 20 guinea pigs were exposed at each level. This was accomplished for each orientation at each velocity in each of the two systems. Using probit analysis, the refined LD50 G level was calculated and the results tabulated for comparison of the two systems for survival potential. Regarding protection, the system employing the isovolumetric principle was markedly superior in $+G_x$ impacts, slightly superior in $-G_x$ impacts, and approximately equal in the $+G_z$ orientation. Protection of the cardiovascular system by the isovolumetric system was markedly superior in $-G_x$ $+G_z$ impacts but only slightly better in $-G_x$ impacts. Comparison of the two thoracic-abdominal systems was made possible by the concomitant use of a previously developed support and restraint system for the head. Author

N69-40815# Michigan Univ., Ann Arbor. Psychology Dept.
PROCESSING OF SEQUENTIALLY PRESENTED SIGNALS IN INFORMATION COMBINING TASKS
Arthur S. Kamlet Jun. 1969 63 p refs US Army Human Eng. Lab. Aberdeen Res. and Develop. Center
(Contract AF 49(638)-1235)
(AD-691728; TM-9-69) Avail: CFSTI CSCL 5/10

Human performance theory has relied heavily upon an experimental paradigm in which speeded performance, or reaction time, is measured as a function of the time intervening between two successive stimuli. The study examined a special form of the two-signal paradigm in which the first stimulus provided the rule or operator for defining the appropriate response to the second stimulus. This form of the two-signal experimental paradigm is called an information-combining task. The aim of the present series of experiments was to examine temporal factors in an information-combining task in order to discriminate among alternative human performance theories. Specifically, the number of alternative operators and the number of alternative second signals were independently varied over a range of intervals between the operator and the second signal. In some tests the interstimulus interval was held constant from trial to trial; in other tests the interstimulus interval varied between successive trials. The findings rejected single-channel theories of information processing in favor of a flexible, capacity-sharing model. The results also suggested that subjects performed sophisticated strategy adjustments to take advantage of subtle features of these information-combining tasks. Author (TAB)

N69-40816# Joint Publications Research Service, Washington, D.C.
GENERALIZATION OF VISUAL STIMULI AS AN EXAMPLE OF SOLUTION OF ABSTRACT PROBLEMS BY BEES
G. A. Mazokhin-Porshnyakov 17 Oct. 1969 20 p refs Transl. into ENGLISH from Zool. Zh. (Moscow), v. 48, no. 8, 1969 p 1125 1138
(JPRS-49083) Avail: CFSTI

The facility of bees with respect to abstract operations of the generalization type was tested by sequential training to distinguish figures transformed with respect to several parameters. It was demonstrated that bees can recognize triangles and rectangles by the number of angles, that is, independently of the size and projective transformation of the figures. Bees perform the act of abstraction from optical noise in the form of spots and bands, and by abstracting from the type of color, shape and size of the figures, they easily generalize them with respect to the dichroism attribute. Bees even turned out to be capable of such more complex operations as generalization of the figures by the presence of a black circle at the end or in the middle of a chain or a black square outside or inside the figure. The expediency of the behavior of the bees in the described experiments is interpreted as a manifestation of elementary reasoning. It is proposed that there is no theoretical difference in the organization of complex forms of behavior of insects and vertebrates. Author

N69-40854# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CONCISE HANDBOOK OF SPACE BIOLOGY AND MEDICINE
A. I. Burnazyan et al 20 Mar. 1969 477 p Transl. into ENGLISH of the book "Kratkiy Spravochnik vo Kosmicheskoy Biologii i Meditsine" Moscow, Izd. Meditsina, 1967 p 1-368
(AD-691356; FTD-HT-23-835-68) Avail: CFSTI CSCL 6/5

A concise fully cross-referenced and cross-indexed encyclopedic dictionary of current terminology in the fields of space biology and space medicine. In addition, the appendix contains tabular material providing detailed data on respiration, water metabolism, energy, nutrition, physical constants, measurement unit conversion factors and space flights carried out by the USSR. Author (TAB)

N69-40900# IIT Research Inst., Chicago, Ill.
METEOROID THREAT TO EXTRAVEHICULAR SPACE SUIT ASSEMBLIES Final Report, 1 Mar. 1966 - 1 Mar. 1967
Frank J. Zimmerman Jun. 1969 23 p refs
(Contract AF 33(615)-3468)
(AD-691461; AMRL-TR-68-86) Avail: CFSTI CSCL 6/17

This report utilizes most recent meteoroid flux data and illustrates the method used in calculating the probability of meteoroid puncture for a space-suited crewman in earth orbit. An example of the method is shown and uncertainties in the prediction are reviewed. Finally, guidelines are presented that could be followed in planning an experimental program of penetration studies on space suit materials intended to resolve some of these areas of uncertainty. Author (TAB)

N69-40919# Oregon Univ., Portland. Psychology Dept.
ELEMENTARY PROCESSES IN PATTERN PERCEPTION Final Report, 1 Aug. 1965 - 30 Jun. 1969
Fred Attneave 1969 11 p refs
(Grant AF-AFOSR-973-66)
(AD-691486; AFOSR-69-1873TR) Avail: CFSTI CSCL 5/10

Work accomplished is described under the following headings: (1) Psychophysical scaling. Transportation was used as a scaling method. By this criterion, the musical scale is better than the mel scale. Manitude judgments were analyzed into input and output components. (2) Perceptual grouping. The kinds of homogeneity that provide similarity grouping were investigated. Slope of elements is the highest order variable that gives decisive grouping. (3) Reference systems. The dependence of stimulus classification on orientational frames of reference was studied in a variety of ways. (4) Space perception. The Gestalt principle of Pragnanz is supported by this research. Perceived tridimensional orientation tends to that which is consistent with the simplest object. Author (TAB)

N69-40931# Chicago Univ., Ill. USAF Radiation Lab.
A FURTHER SURVEY OF COMPOUNDS FOR RADIATION PROTECTION Final Report, Jan. 1961 – Apr. 1965
Vivian Plzak and John Doull Feb. 1969 87 p
(Contract AF 41(609)-2977)
(AD-691490; SAM-TR-69-1) Avail: CFSTI CSCL 6/15

The report summarizes the results obtained with 617 compounds tested for their radioprotective activity in adult male mice irradiated with a control-demonstrated LD(99+) of 800 R (250 kvp) x-rays. A compound was considered to exhibit radioprotective activity if it (1) permitted any of the treated mice to survive for 30 days after the otherwise lethal whole-body x-irradiation or (2) increased the median survival time of treated animals by 5 days or more beyond the median survival time of the untreated control mice (9 plus or minus 3 days). Of the 617 compounds tested, 245 successfully passed one or both of the stated specifications. Additionally, data are offered to allow comparisons of chemically related groups for structure-activity relationships, and to indicate the types of structures which offer the greatest promise as a source of more effective and less toxic radioprotective agents. Author (TAB)

N69-40955*# Union Carbide Corp., Tonawanda, N.Y. Linde Div. Research Lab.
BIOCHEMICAL AND METABOLIC EFFECTS OF A SIX-MONTH EXPOSURE OF SMALL ANIMALS TO A HELIUM-OXYGEN ATMOSPHERE
Robert W. Hamilton, Jr., Janis D. Cohen, Gerald F. Doebbler, Lorenzo F. Exposito, John M. King, et al Washington NASA Oct. 1969 90 p refs
(Contract NAS2-3900)
(NASA-CR-1372) Avail: CFSTI CSCL 04C

Selected biochemical analyses were made on the parent and two successive generations of mice. These included blood indices; electrophoretically separated tissue protein patterns from liver, skeletal muscle, and cardiac muscle; quantitative determinations of LDH, MDH, and G6PDH from the same tissues; serum insulin; and semi-quantitative histochemical estimates of liver glycogen. No cases of statistically significant difference or consistent trends were seen between the experimental environmental groups. Additional analyses of liver nucleotides and redox-coenzymes also failed to show a significant difference. The relative weights of liver, heart, kidney, and diaphragm (wet and dry) were the same in both groups. Histopathological examination of kidney and adrenal tissue produced unremarkable findings and none that were attributable to the nature of the gaseous environment. It must be concluded that prolonged exposure to helium–oxygen, relative to air, does not produce detectable changes in several key subcellular factors which might be altered by serious metabolic disturbances, and therefore the helium exposure is well tolerated. Author

N69-40956# Applied Psychological Services, Wayne, Pa. Science Center.
A FORCED-CHOICE INSTRUMENT FOR EVALUATING VISUAL INFORMATION DISPLAYS
Arthur I Siegel, M. A. Fischl, and Douglas H. Mac Pherson Apr. 1969 79 p refs
(Contract N00014-66-C-0183)
(AD-687182) Avail: CFSTI CSCL 5/8

An instrument (called the analytic profile system (APS)) for visual display evaluation was developed and subjected to an initial validation. The APS is based on seven factors derived from a multidimensional scaling analysis of the display-observer interface. Prose statements (items) were prepared covering these dimensions, were scaled for favorableness, and were then arranged in tetrad forced-choice format. The report presents results of investigations into the dimensional homogeneity, and into the concurrent validity, equivalence, and stability of the developed instrument. A copy of the final form is included. Author (TAB)

N69-40980# Florida Univ., Gainesville. Dept. of Entomology.
CELLULAR INDICATORS OF RADIOSENSITIVITY Final Report, May 1967 – May 1968
Harvey L. Cromroy May 1969 109 p refs Prepared for Office of Civil Defense, Army
(Contract N00228-67-C-2312)
(AD-691882; TRC-68-49) Avail: CFSTI CSCL 6/18

The research was designed to further substantiate and elaborate on the correlation between interphase chromosome volume and LD50 of a species as an effective predictor of radiation sensitivity. The predictive equations could then be introduced into overall models on ecological effects from a given dose of radiation. The study is subdivided into three areas: plants, insects, and mammals. TAB

N69-40984# California Univ., Los Angeles. Dept. of Anatomy.
ELECTROENCEPHALOGRAPHIC AND BEHAVIORAL STUDIES OF MONOMETHYLHYDRAZINE TOXICITY IN THE CAT Final Report
M. B. Sterman, R. W. Lo Presti, and M. D. Fairchild Wright-Patterson AFB, Ohio AMRL Jun. 1969 15 p refs
(Contract AF 33(615)-2822)
(AD-691474; AMRL-TR-69-3) Avail: CFSTI CSCL 6/20

The toxicity of monomethylhydrazine (MMH) administered intraperitoneally in the cat was studied by reference to behavioral and neurophysiological indices. The acute toxicity LD50 value for MMH was established as 15 mg/kg, and the CD50 as 7 mg/kg. Doses of 18, 9, and 5 mg/kg were then studied systematically in an effort to classify lethal, convulsive and subconvulsive symptoms. For these doses, a preconvulsive syndrome was described involving recurrent and sustained symptoms including vomiting, panting, rapid respiration, viscous salivation, hyperactivity and subcortical seizure activity. The onset latency of these symptoms was directly related to dose. Several lines of evidence suggested at least a partial independence between the biochemical and neurophysiological events responsible, on the one hand, for convulsions, and on the other for this preconvulsive syndrome. Convulsions were specifically delayed or prevented in animals trained to suppress movement through the use of a special EEG conditioning technique. Author (TAB)

N69-40988# California Univ., Los Angeles. Dept. of Anatomy.
SUBCONVULSIVE EFFECTS OF MONOMETHYLHYDRAZINE ON RUNWAY PERFORMANCE IN THE CAT Final Report, Jan. 1967 – Nov. 1968
M. B. Sterman, M. D. Fairchild, and H. B. Van Twyver Wright-Patterson AFB, Ohio AMRL Jun. 1969 14 p refs
(Contract AF 33(615)-2822)
(AD-691473; AMRL-TR-68-183) Avail: CFSTI CSCL 6/20

Previous neurophysiological and behavioral studies of the toxic propellant UDMH have indicated that its subtle-dose influences can be most effectively evaluated in the cat by reference to trained locomotor performance. To determine similar fundamental information in evaluating monomethylhydrazine (MMH), a related derivative of hydrazine, this same technique was employed. Cats were trained and tested in a special runway apparatus to provide a reliable indication of performance changes over a 6-hour period following the administration of 1, 2, and 4 mg/kg MMH. These low doses significantly altered locomotor performance, both during drug session testing and saline control testing carried out 24 hours later. Within 30 minutes after injection of all three doses of MMH, runway performance was depressed. At 2 and 4 mg/kg, this influence was profound and was associated with overt physiological symptoms of toxicity. A total disruption of performance occurred with 4 mg/kg doses when tested 2-5 hours after administration. Performance was still depressed after 24 hours following 4 mg/kg, but was actually facilitated at this same point following 1 and 2 mg/kg doses. Author (TAB)

N69-41053*# Massachusetts Inst. of Tech., Cambridge. Dept. of Mechanical Engineering.

MEASUREMENT AND DISPLAY OF CONTROL INFORMATION - REMOTE MANIPULATION AND MANUAL CONTROL Progress Report, 1 Oct. 1968 - 31 Mar. 1969
Thomas B. Sheridan and William R. Ferrell 31 Mar. 1969 47 p refs
(Grant NGR-22-009-002)
(NASA-CR-106365; DSR-70283-10) Avail: CFSTI CSCL 05H

In the remote manipulation study, data from a delay-lag experiment were modeled for the general case of human supervision in informational and/or decision theory terms. Initial tests were conducted on an air jet touch display, with emphasis on a hardware demonstration. An inductive displacement transducer was built for a remote-touch sensor. Formal data structures were studied for computer-aided planning of manipulation task execution. In the manual control study, work is summarized on behavioral sources of suboptimal human performance in discrete control tasks. A program, an experimental procedure, and the theory of a limited-preview, goal-directed maze solver are described. The effects of task complexity on operator performance were analyzed, and results of a study of two-person games with continuous variables are summarized. K.W.

N69-41123# General Electric Co., Philadelphia, Pa. Valley Forge Space Center.
BACTERIA SENSOR FOR REPROCESSED WATER-MICROBIOLOGY RESEARCH, DESIGN, AND FABRICATION Final Report, 1 May 1967 - 31 Aug. 1968
John A. Geating and Fred P. Rudek Wright-Patterson AFB, Ohio AMRL Feb. 1969 73 p refs
(Contract F33615-67-C-1564)
(AD-691471; AMRL-TR-68-173) Avail: CFSTI CSCL 6/11

The results of the developmental research leading to the design and fabrication of a short-time, electronic sensor to monitor the bacteriological quality of reprocessed water aboard spacecraft are reported. The basic sensing capability is furnished by a Coulter Counter that selectively detects and counts particles of bacterial size. Detection is accomplished by comparing the number of bacteria-size particles in the reprocessed water sample at some point in time with a particle count at some future point in time, i.e., following the establishment of conditions necessary to allow growth and multiplication of bacteria. A significant difference between the two counts strongly implies bacterial replication, and therefore the presence of viable organisms in the raw reprocessed water. Author (TAB)

N69-41169*# Naval Aerospace Medical Inst., Pensacola, Fla.
CHANGES IN SUBJECTIVE ESTIMATES OF WELL-BEING DURING THE ONSET AND REMISSION OF MOTION SICKNESS SYMPTOMATOLOGY IN THE SLOW ROTATION ROOM
James T. Reason and Ashton Graybiel 19 Jul. 1969 19 p refs
(NASA Order R-93)
(NASA-CR-106280; NAMI-1083) Avail: CFSTI CSCL 06S

The onset of motion sickness is characterized by a decline in generalized feelings of well-being. In this study an attempt was made to quantify these subjective changes during the experimental production of motion sickness. A simple eleven-point rating scale was used to measure the well-being state. The nature and the time of onset of symptoms were recorded independently. Systematic relationships were obtained between the amount of stimulation required to produce the Malaise III endpoint and the rate of change of well-being. In general, relatively susceptible individuals showed an immediate decline in well-being at the onset of the stimulus which continued to fall sharply until the endpoint was reached. With increasing resistance to motion sickness, this point of rapid decline was proportionately delayed. The point on the rating scale at which this rapid decline began was relatively consistent across all subjects. Various positions along the well-being scale were consistently associated with specific constellations of symptoms. The recovery of well-being, following the cessation of the stimulus, appeared to be slower in individuals of low susceptibility than in those who were highly susceptible. Author

N69-41174*# Naval Aerospace Medical Inst., Pensacola, Fla.
MAGNITUDE ESTIMATIONS OF CORIOLIS SENSATIONS
James T. Reason and Ashton Graybiel 18 Jul. 1969 16 p refs
(NASA Order R-93)
(NASA-CR-106389; NAMI-1082) Avail: CFSTI CSCL 06S

The purpose of the first experiment was to investigate the nautre of the psychophysical function relating magnitude estimates of the strength of the Coriolis vestibular reaction to the speed of platform rotation. This relationship was investigated under four experimental conditions: 1) eyes closed, head tilt to the right; 2) eyes closed, head tilt left; 3) eyes open, head tilt right; and 4) eyes open, head tilt left. A second experiment compared the relative strengths of the tilt and return motions in the right and left quadrants. In all cases, the extent of the head motion was 30°, and rotation was in the counterclockwise direction throughout. Geometric mean magnitude estimates of Coriolis sensations increased as a power function of angular velocity in all four experimental conditions. Magnitude estimations obtained in the vision-present condition were generally greater than those for the vision-absent condition. For both conditions of visual reference, magnitude estimates relating to the right head tilt were greater than those for the left head tilt. In the second experiment, it was found that the strongest reaction was produced by the return from the left shoulder and the next strongest by the return from the right shoulder. The subjective rankings did not differentiate between the right and left tilt motions. Author

N69-41175*# Naval Aerospace Medical Inst., Pensacola, Fla.
PROGRESSIVE ADAPTATION TO CORIOLIS ACCELERATIONS ASSOCIATED WITH 1-RPM INCREMENTS IN THE VELOCITY OF THE SLOW ROTATION ROOM
James T. Reason and Ashton Graybiel 17 Jul. 1969 19 p refs
(NASA Order R-93)
(NASA-CR-106388; NAMI-1081) Avail: CFSTI CSCL 06S

Ten men with normal vestibular function executed controlled head and body movements at each of ten 1-rpm step increases in the velocity of a slow rotation room. On the completion of each movement, subjects were required to indicate whether or not they had detected sensations of vestibular or somatosensory origin. At each velocity step, the movements were continued until each of twenty-four consecutive movements had elicited a negative response and the subject was judged to be symptom free. When this arbitrary adaptation criterion was reached, the angular velocity was increased by 1 rpm and the procedure repeated. On attaining the criterion at the terminal velocity (10 rpm), the rotation was stopped and the postrotatory phenomena were investigated using the same techniques. The principal finding was that the number of movements necessary to achieve the adaptation criterion was systematically related to the absolute level of angular velocity. The results suggest two findings that are relevant to the construction of an adaptation schedule: (1) rotation may safely commence at 2 rpm; and (2) the number of head movements necessary to achieve adaptation at each step velocity must be graded to the absolute speed of rotation in order to dispense with them in the most economic manner. Author

N69-41267# Naval Electronic Systems Command, Patuxent River, Md.
TECHNICAL MANUALS, HUMAN FACTORS, AND SYSTEM EFFECTIVENESS
Joseph B. Blankenheim 22 May 1969 24 p Presented at the System Performance Effectiveness Conf., 22 May 1969
(AD-691418) Avail: CFSTI CSCL 5/2

The technical manual is the link between the man and his machine, and, effectiveness for the system can only be realized if the manual is adequate. The use of human factor engineers to assist in the procurement of manuals is one method of improving manuals. Author (TAB)

N69-41282# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
MODELING OF THE REGULATORY FUNCTION OF THE CARDIOVASCULAR SYSTEM IN WEIGHTLESSNESS
I. I. Kasyan et al 21 May 1969 15 p refs Transl. into ENGLISH from Russian J.
(AD-692356; FTD-MT-24-04-69) Avail: CFSTI CSCL 6/19

Electric models of the human cardiovascular system in terrestrial and weightless conditions are presented and discussed. Diagrams of the model are shown for the organism at rest, during functional physical effort, and the change in pulse rate caused by a measured physical effort. Under conditions of weightlessness, execution of ordinary tasks evidently requires much more time than on earth. It is concluded that it will probably be necessary to allot more time for rest during weightlessness so that periodic physical work can be properly executed. Author

N69-41322*# Martin Marietta Corp., Baltimore, Md. Research Inst. for Advanced Studies.
EXTRATERRESTRIAL LIFE DETECTION BY ENZYMATICALLY INDUCED EXCHANGE OF O-18 Annual Report, 15 May 1968 - 15 May 1969
Bessel Kok 15 May 1969 10 p refs
(Contract NASw-1735)
(NASA-CR-106454) Avail: CFSTI CSCL 06A

An investigation into extraterrestial life is conducted based not only on earth-like characteristics, but on properties basic to all living systems; enzymatic catalysis of oxygen exchange between water and certain common oxyanions. Investigations are continuing with no conclusive evidence reported. E.H.N.

N69-41335# Lockheed Missiles and Space Co., Palo Alto, Calif.
PATHO-MORPHOLOGICAL AND HISTOCHEMICAL CHANGES IN THE ORGANS OF TURTLES ON BOARD THE ZOND-5 PROBE
N. A. Gaidamakin et al 1969 12 p refs Transl. into ENGLISH from 18th IAF Conf., Buenos Aires, 1969
Avail: National Translations Center, John Crerar Library, Chicago, Ill. 60616

An experiment was conducted using adult turtles divided into a test group, which was carried aboard the Zond 5 probe, and a control group, which was transported to the cosmodrome and returned to the laboratory. The test animals were subjected to 39 days of starvation, flight factors lasting 7 days, the effect of a tropical climate and conditions associated with a period in the ocean following splashdown, and transportation via ship and aircraft. Total radiation received by the animals did not exceed 3.5 rad. Results of a number of hematological tests, electrocardiography, and a number of pathomorphological and histochemical investigations indicate that the complex of space flight factors, combined with starvation, caused mainly changes of an atrophic nature in the organs. Starvation and transportation to the cosmodrome resulted in less definite tissue atrophy. Finally, comparison of changes occurring in the test and control animals showed that the fundamental structural changes in the turtles were caused by starvation and, to a lesser degree, by space flight factors. A.C.R.

N69-41362 Defence Research Establishment Toronto, Downsview (Ontario).
AN ANALOGUE COMPUTER ANALYSIS OF THE DOUBLE PENDULUM PROBLEM
L. A. Kuehn and R. S. Weaver Jan. 1969 51 p refs
(DRET-724) Copyright: Avail: Issuing Activity

A model of a parachute-man-seatpack system descending to the ground, based on a double pendulum system, is developed. Exact and approximate equations of motion of the system are discussed. Solutions of these equations by analog computation are presented and compared with the exact and approximate mathematical solutions. The effects of damping and forcing functions are also considered. The practical implications of this analysis are discussed briefly. Author

IAA ENTRIES

A69-41291 #
ABDOMINAL GAS VOLUME AT ALTITUDE AND AT GROUND LEVEL.
A. J. Greenwald, T. H. Allen, and R. W. Bancroft (USAF, School of Aerospace Medicine, Physiology Branch, Brooks AFB, Tex.).
Journal of Applied Physiology, vol. 26, Feb. 1969, p. 177-181. 11 refs.

The effect of decreasing barometric pressure on abdominal gas volume in 18 military men, who agreed to avoid passing of gas, was studied under simulated flight conditions with a water displacement volumeter. At ground level, abdominal gas averages 111 ml—an amount statistically different from zero. This is significantly less than the mean 218 ml occurring in the presence of a water-filled nasogastric catheter connected to a pressure transducer. Expansion results in 500 ml of abdominal gas at an altitude of 29,600 ft (230 torr). At this point, 50 per cent of the subjects reported abdominal fullness. At yet lower pressures, pain was reported at which time the average abdominal gas volume was computed to be 1090 ml.(Author)

A69-41292 #
DECOMPRESSION SICKNESS IN SIMULATED "ZOOM" FLIGHTS.
Thomas H. Allen and Sarah E. Beard (USAF, School of Aerospace Medicine, Physiology Branch, Brooks AFB, Tex.).
Journal of Applied Physiology, vol. 26, Feb. 1969, p. 182-187. 19 refs.

At the moment the subjects were beginning to breathe oxygen, a decompression was abruptly started and continued for 60 min at rates ever decreasing but always sufficient to maintain enough dissolved nitrogen in either 2000, 3000, or 4000 cubic microns of circulating venous blood to form bubbles of a postulated critical size. Among 44 men, singly taking 322 such "zoom" flights, there were 20 who never had the joint pain of bends, paresthesia, or the distress of chokes. Among the 24 susceptible men at rest there was one case in ten zoom 4000 flights, 12 in 46 zoom 3000, increasing to 28/79 during zoom 2000. Mark time at the 29-th min, repeated thereafter every 5 min, increased the incidence. The probability of forming bubbles seems much greater when the requisite number of nitrogen molecules are contained in less than 4000 cubic microns of systemic venous blood. Bends resistance may possibly be due to an instantaneous surface tension of blood greater than 58 dynes/cm. (Author)

A69-41293
INSENSIBLE WATER LOSS FROM HUMAN SKIN AS A FUNCTION OF AMBIENT VAPOR CONCENTRATION.
A. B. Goodman and A. V. Wolf (Illinois, University, Dept. of Physiology, Chicago, Ill.).
Journal of Applied Physiology, vol. 26, Feb. 1969, p. 203-207. 23 refs.
NSF-supported research; PHS Grant No. H-4517.

The insensible water loss from small areas of human skin was studied by means of IR gas analysis. A decrease in this loss occurs as ambient vapor pressure is increased. The relationship appears to be nonlinear and does not support a current hypothesis of cutaneous insensible water loss. A revised model of insensible water loss from human skin has been derived on the basis of these findings and additional theoretical considerations. (Author)

A69-41294
MEASUREMENT OF BLOOD FLOW IN THE LIMB OF MAN BY CUVETTE DENSITOMETRY.
Roger A. Wolthuis, Henry W. Overbeck, and W. D. Collings (Michigan State University, Dept. of Physiology and Dept. of Medicine, East Lansing, Mich.).
Journal of Applied Physiology, vol. 26, Feb. 1969, p. 215-220. 12 refs.
NIH Grant No. HE-10922.

A Gilson cuvette densitometer was used to continuously measure venous indocyanine green dye concentrations in the dog forelimb and human forearm and hand during constant intrabrachial arterial dye infusion (0.42 mg/min). Blood flow was thereby calculated by dye dilution. In the isolated pump-perfused forelimbs of eight dogs, dyed venous blood was withdrawn through the cuvette at 1.5 ml/min, and measured flow was compared to actual venous outflow. In the limbs of eight men, venous blood was withdrawn at 1.5 or 2.4 ml/min, and measured flows were compared to those simultaneously obtained by RISA dilution. In 69 paired measurements in dogs, the correlation coefficient between actual and calculated flow was 0.97. In 27 paired measurements in man, the correlation coefficient between dye-dilution- and RISA-dilution-calculated blood flow was 0.97. During constant intravascular dye infusions lasting up to 3 hr, recirculating dye concentration remained low and quite constant. It is concluded that the cuvette densitometer system is useful for continuous and reasonably accurate measurement of steady-state blood flow in the forearm and hand of man. (Author)

A69-41295 *
SINGLE-CHANNEL PRESSURE TELEMTRY UNIT.
Harold Sandler, Thomas B. Fryer (NASA, Ames Research Center, Moffett Field, Calif.), and Boris Datnow (Mayo Clinic, Dept. of Pathology, Rochester, Minn.).
Journal of Applied Physiology, vol. 26, Feb. 1969, p. 235-238. 8 refs.

Description of single-channel pressure telemetry unit which is capable of chronic implantation. Reliable function of these units has been obtained for up to 6 months. Recent units have been modified to include a magnetic latching or radio frequency switch. Small size and low power consumption have been achieved without sacrificing accuracy and reliability. This approach is advocated for experimental situations requiring pressure measurements in free-ranging animals or in experimental animals in hostile environments. (Author)

A69-41296
SUPERSATURATION OF BLOOD WITH O_2.
C. Christoforides and J. Hedley-Whyte (Harvard University, Harvard Medical School, Beth Israel Hospital, Dept. of Anesthesia, Boston, Mass.).
Journal of Applied Physiology, vol. 26, Feb. 1969, p. 239, 240. 14 refs.
PHS Grants No. HE-12164-01; No. GM-15904-01.

When blood was equilibrated with 1 atm of oxygen at low temperature and then warmed to 37 deg C, oxygen tensions measured with electrodes increased to as high as 1400 torr, provided the blood was not stirred. When the blood was stirred, gas was liberated and tension in the blood rapidly fell to approximately 1 atm. Published factors were adequate for correction of temperature effects in unstirred blood, but loss of oxygen from stirred blood invalidates all attempts at correction. (Author)

A69-41300
RADIOPROTECTIVE PROPERTIES OF SOME HETEROCYCLIC NITROGENOUS COMPOUNDS AGAINST X-RADIATION INJURY TO SERUM PROTEINS IN MICE.
H. Roushdy (Commissariat à l'Energie Atomique, Centre d'Etudes Nucléaires de Grenoble, Laboratoire de Radiobiologie, Grenoble, France; Atomic Energy Establishment, Dept. of Radiobiology, Cairo, Egypt), T. Pierotti, and M. Polverelli (Commissariat à l'Energie Atomique, Centre d'Etudes Nucléaires de Grenoble, Laboratoire de Radiobiologie, Grenoble, France).
Zeitschrift für Naturforschung, Teil b, vol. 24b, May 1969, p. 622-630. 22 refs.

Investigation of the radiation damage to the blood serum of groups of white male mice exposed to various X-ray doses after

intraperitoneal administration of 0.35 mg per gram body weight of imidazole (in an isotonic NaCl solution) or benzimidazole (in 10 per cent solution of 1, 2 propanediol). Lethal changes in the protein-component composition of the blood serum are noted in control mice after exposure to X-ray doses of 750 r. On the other hand, the radiation-evoked changes in the blood-serum proteins vanish within a period of about four days after exposure in mice protected by imidazole or benzimidazole administration. V.Z.

A69-41303 #
WEIGHT LOSS DURING MANNED SPACE MISSIONS.
F. T. de Dombal (General Infirmary, Leeds, England).
British Interplanetary Society, Journal, vol. 22, Aug. 1969, p. 261-265. 6 refs.

Criticism of claims that weight loss during space missions is independent of mission duration, that the loss is due to fluid shift or fluid loss, and that it is regained within 24 hr after mission completion. Evidence is presented suggesting that none of these conclusions fits the known facts. Alternative mechanisms to explain the degree of weight loss are tentatively suggested and discussed, and specific predictions are made concerning the Apollo flights (predictions which appear to be borne out from preliminary results in the Apollo 7 and 8 missions.) (Author)

A69-41311 •
ANTIDIURETIC HORMONE AND HUMAN ECCRINE SWEATING.
Juan Carlos Fasciolo (Illinois, University, Dept. of Physiology and Biophysics, Human Environmental Research Unit, Urbana, Ill.; Cuyo, Universidad Nacional, Departamento de Fisiologia, Mendoza, Argentina), Gregory L. Totel, and Robert E. Johnson (Illinois, University, Dept. of Physiology and Biophysics, Human Environmental Research Unit, Urbana, Ill.).
Journal of Applied Physiology, vol. 27, Sept. 1969, p. 303-307. 11 refs.
Research supported by the University of Illinois; Grant No. NGR-14-005-050.

The effects of antidiuretic hormone (ADH) and bradykinin on the human sweat gland were studied by subdermal injection in the forearm, abdomen, and leg. Dose ranges were .008 to 80 mU/ml for ADH and 50-100 microgram/ml for bradykinin. Sweat was collected under unventilated capsules from the injected side and from the symmetrical control side for three 40-min periods per experiment. Sweating was stimulated either by placing the subject in a hot room or by the subdermal injection of acetyl-beta-methylcholine chloride (200 microgram/ml). ADH reduced the sweat rate. It also increased the sodium concentration in sweat, but not proportionally with the decrease in sweat rate. The interpretation is that ADH increases water reabsorption as a consequence of increasing the permeability of the sweat duct and that it also stimulates the active reabsorption of sodium. Bradykinin also reduced the sweat rate, but to a lesser degree than ADH. (Author)

A69-41312
EFFECT OF PHYSICAL TRAINING IN ADOLESCENT BOYS.
Björn Ekblom (Institute of Physical Education, Dept. of Physiology, Stockholm, Sweden).
Journal of Applied Physiology, vol. 27, Sept. 1969, p. 350-355. 21 refs.
Research supported by the Swedish Sports Federation, the Swedish National Association Against Heart and Chest Diseases, and the Kungl. Karolinska Institutet.

Six boys, all 11 years of age at the start of the experiment, were studied before and after six months of physical training. A nontraining group of seven boys of the same age was studied at the same time. The maximal oxygen uptake of the training group improved from 2.15 to 2.48 liters/min (15 per cent), but was unchanged in the reference group. Five boys from the training group continued training for a further 26 months, and it was then found that maximal oxygen uptake had increased in total by 55 per cent, vital capacity by 54 per cent, and heart volume by 43 per cent, which was more than expected from the age-dependent increase in body size in terms of body height. The training group had an accelerated rate of increase in body height with age, when compared with growth estimates contained in charts, but this was not the case in the reference group. (Author)

A69-41313
BETA-BLOCKADE AND EMOTIONAL TACHYCARDIA--RADIOTELEMETRIC INVESTIGATIONS IN SKI JUMPERS.
P. R. Imhof, K. Blatter (Federal School of Gymnastics and Sport, Research Institute, Magglingen, Switzerland), L. M. Fuccella, and M. Turri (Ciba, Ltd., Pharmaceutical Dept., Biological Laboratory and Medical Dept., Biological Laboratory, Basel, Switzerland).
Journal of Applied Physiology, vol. 27, Sept. 1969, p. 366-369. 7 refs.

Heart rate measurements with the aid of a radiotelemetric system in nine experienced ski jumpers revealed the presence of tachycardia due purely to physical effort during climbing and purely to emotional stress when the athlete was waiting on the platform for the starting signal. The highest heart rate, which is attributable to the liberation of catecholamines during the jump, was recorded 15 sec after landing. Mean heart rate varied in the course of the jumping procedure, including the climb to the platform, between 110.0 plus or minus 2.9 and 145.8 plus or minus 1.3 beats/min. There were hardly any values below 100 beats/min. Oxprenolol, a specific beta-receptor blocking agent, diminished effort tachycardia by 15.0 per cent and emotional tachycardia by 34.2 per cent. From this, it is concluded that tachycardia due to emotional stress is predominantly mediated by adrenergic beta-receptors. (Author)

A69-41314 #
CARDIOVASCULAR EFFECTS OF LOW-OXYGEN ATMOSPHERES IN CONSCIOUS AND ANESTHETIZED DOGS.
L. D. Horwitz, V. S. Bishop, H. L. Stone, and H. F. Stegall (USAF, School of Aerospace Medicine, Brooks AFB, Tex.).
Journal of Applied Physiology, vol. 27, Sept. 1969, p. 370-373. 11 refs.

A group of conscious dogs (with Doppler ultrasonic flow transducers on the ascending aorta and catheters in the left and right atria, pulmonary artery, and thoracic aorta) were exposed for 30 min to atmospheres with oxygen pressures of 85, 70, 55, or 40 mm Hg in an environmental chamber. Hypoxia resulted in a rise in pulmonary artery pressure, a fall in left atrial pressure, tachycardia, and a fall in stroke volume without alteration in cardiac output. Some of the dogs were subsequently studied during pentobarbital anesthesia. Large increases in cardiac output were noted at mild levels of hypoxia, but a decrease was noted in output at a more severe level. It is concluded that marked differences occur in cardiac responses to hypoxia in the conscious vs the anesthetized state and that the major hemodynamic alterations in conscious, resting dogs are tachycardia and a redistribution of blood flow. (Author)

A69-41315
REDISTRIBUTION OF STRATIFIED PULMONARY BLOOD FLOW DURING EXERCISE.
John Read (Sydney, University, Dept. of Medicine, Sydney, Australia).
Journal of Applied Physiology, vol. 27, Sept. 1969, p. 374-377. 9 refs.
Research supported by the National Heart Foundation of Australia, the Australian Research Grants Committee, and the University of Sydney.

Distribution of stratifed blood flow within the secondary lung lobule was studied by analysis of breath-holding changes at early and late points on expired argon and nitrous oxide tension plateaus, after inhalation of a test mixture containing both gases. This distribution was compared at rest and during exercise in six normal subjects. At rest, there was generally a gradient of diminishing blood flow per unit of alveolar volume from proximal to peripheral portions of the lobule. During exercise, the blood flow per unit of alveolar volume

increased in the proximal part of the lobule in all subjects and in the distal part in five of six subjects. As a result of different proportional changes in the blood flow per unit of alveolar volume in different parts of the lobule, the resting gradient of the blood flow per unit of alveolar volume was reversed in three subjects, unchanged in two subjects, and exaggerated in one subject. Those subjects who showed a reversal of the stratified lobular blood flow per unit of alveolar volume gradient on exercise were those who had previously shown marked regional redistribution of pulmonary blood flow on exercise. (Author)

A69-41316
MIXED VENOUS P_{O_2}, P_{CO_2}, pH, AND CARDIAC OUTPUT DURING EXERCISE IN TRAINED SUBJECTS.
J. C. Cruz, H. Rahn, and L. E. Farhi (New York, State University, School of Medicine, Dept. of Physiology, Buffalo, N.Y.).
Journal of Applied Physiology, vol. 27, Sept. 1969, p. 431-434. 20 refs.
USAF-supported research.

The rebreathing method of Cerretelli et al. makes it possible to determine mixed venous oxygen pressure at rest and during exercise. For calculating the cardiac output, it is necessary to convert oxygen pressure to oxygen content. During exercise, changes in blood pH shift the oxygen dissociation curve and must be taken into account. In three young male athletes, calculated mixed venous blood pH dropped to 7.24 at peak exercise. The effects of this change and the correction factor it imposes are discussed. (Author)

A69-41317
PROPOSED STANDARD SYSTEM OF SYMBOLS FOR THERMAL PHYSIOLOGY.
A. P. Gagge, J. D. Hardy, and G. M. Rapp.
Journal of Applied Physiology, vol. 27, Sept. 1969, p. 439-446. 8 refs.

Compilation of a standard system of symbols for thermal physiology representing a consensus of ideas received from about 80 contributors. The proposed standard consists of five sections: (1) principal physical quantities, (2) physical subscripts, (3) physiological subscripts, (4) special quantities for the body heat balance equation, and (5) special quantities useful for describing heat exchange. Z.W.

A69-41364
THE CARDIAC LYMPHATICS IN EXPERIMENTAL CHRONIC CONGESTIVE HEART FAILURE.
Herman N. Uhley, Sanford E. Leeds, John J. Sampson, and Meyer Friedman (Mount Zion Hospital and Medical Center, San Francisco, Calif.).
Society for Experimental Biology and Medicine, Proceedings, vol. 131, June 1969, p. 379-381. 6 refs.
PHS Grant No. H-3180.

Study of the effect of experimentally induced chronic congestive failure on canine cardiac lymph flow. Cardiac lymphatics were cannulated in 12 dogs. Chronic congestive failure was previously induced in six of these dogs. The results obtained suggest that in chronic congestive failure the cardiac lymphatics expand slightly, but cardiac lymph flow is not significantly increased. This is in contrast to the pulmonary lymphatic system in chronic congestive failure, in which great expansion and increase in lymph flow occurs. P.G.

A69-41365
RESPONSES OF SYSTEMIC ARTERIAL PRESSURE AND HEART RATE TO INCREASED INTRAPULMONARY PRESSURE IN ANESTHETIZED DOGS.
K. David Hayashi (Rochester, University, School of Medicine and Dentistry, Dept. of Medicine; Strong Memorial Hospital, Rochester, N.Y.).
Society for Experimental Biology and Medicine, Proceedings, vol. 131, June 1969, p. 426-429. 9 refs.
Research supported by the Genesee Valley Heart Association; PHS Grants No. HE-03966; No. HE-5500.

Simulation of the Valsalva test in anesthetized dogs by increasing intrapulmonary pressure with inflation of the lungs through an endotracheal tube. It is found that the changes in heart rate and arterial pressure are quite similar to those observed during the Valsalva maneuver in normal subjects. When higher intrapulmonary pressure was applied, some abnormal responses occurred, which are thought to be related to muscle relaxation from anesthesia. The role of mechanical and neural regulatory factors is analyzed and discussed. P.G.

A69-41380 #
INFLUENCE OF STRUCTURAL DIFFERENCES OF THE GYRAL AND SULCAL AREAS OF THE ACOUSTIC PROJECTION CORTEX ON PRIMARY INDUCED ACOUSTIC RESPONSES.
Jan Trąbka, Jan Sekuła, and Jerzy Kreiner (Akademia Medyczna, Klinika Otolaryngologii, Kraków, Poland).
Acta Physiologica Polonica, vol. 19, no. 5, 1968, p. 564-570. 6 refs. Translation.
Research supported by the Polska Akademia Nauk.

Attempt to determine the manner in which the acoustic response parameters depend on whether they are derived from the gyrus or from the sulcus of the primary acoustic area. Experiments were performed on 26 cats. The responses of the acoustic projection cortex were recorded using silver electrodes, simultaneously from the gyrus and sulcus at both sides of the stimulated ear. The microphone potentials and the action potential of the acoustic nerve were recorded. The behavior of responses in relation to the site of their derivation was studied. The peaks of curves derived from the sulcus showed inverted polarity as compared with peaks derived from the gyrus. The primary peaks from the sulcus or gyrus of the opposite hemisphere to that of the stimulated ear behaved oppositely to the analogous peaks of the hemispheres on the side of the stimulated ear. (Author)

A69-41381 #
LEVEL OF ACETYLCHOLINE IN RAT BRAIN TISSUE AS AFFECTED BY A SINGLE EXPOSURE TO MECHANICAL VIBRATION.
Zofia Brzezińska (Polish Academy of Sciences, Experimental and Clinical Medical Research Center, Dept. of Work Physiology, Warsaw, Poland).
Acta Physiologica Polonica, vol. 19, no. 5, 1968, p. 616-625. 25 refs. Translation.

Experimental study of the effect of mechanical vibrations and noise on the level of acetylcholine in the rat brain. It is found that a single exposure of rats to the cumulative effect of mechanical vibrations and noise produced an increase of acetylcholine in the brain tissue and a decrease in the activity of acetylcholine esterase. The ability of brain tissue to synthesize acetylcholine was also decreased. Z.W.

A69-41382 #
REGRESSION OF CHANGES IN ACETYLCHOLINE CONCENTRATION INDUCED IN RATS BY A SINGLE TWO-HOUR EXPOSURE TO MECHANICAL VIBRATIONS.
Zofia Brzezińska (Polish Academy of Sciences, Experimental and Clinical Medical Research Center, Dept. of Work Physiology, Warsaw, Poland).
Acta Physiologica Polonica, vol. 19, no. 5, 1968, p. 626-632. 5 refs. Translation.

Study of the regression process in the acetylcholine level in 244 rats after a single two-hour exposure to mechanical vibrations and noise. It is found that the changes in acetylcholine concentration, acetylcholine esterase activity, and the ability of brain tissue to synthesize acetylcholine induced by these vibrations and noise receded after eight days. Z.W.

A69-41383 #
INFLUENCE OF TRAINING ON PERFORMANCE CAPACITY OF RATS AND THEIR RESISTANCE TO ALTITUDE HYPOXIA AND ACCELERATION.
Jerzy Sołtysiak (Polish Academy of Sciences, Experimental and Clinical Medical Research Center, Dept. of Work Physiology, Warsaw, Poland).
Acta Physiologica Polonica, vol. 19, no. 5, 1968, p. 633-639. 19 refs. Translation.

Study of the effect of training under conditions of normal atmospheric pressure on the performance capacity of rats and on their resistance to hypoxia at high altitudes and accelerations. Experiments were performed on 56 rats, trained on an electric treadmill for six weeks. It is found that physical training increases the maximum performance capacity both under normal as well as lowered atmospheric pressure (7000 m), or after a 15-min exposure to an acceleration of plus 10 g. Physical training did not affect the survival time of rats exposed to a still lower atmospheric pressure (12,000 m) and to an acceleration of plus 15 g, in comparison with the untrained control rats. Training on a centrifuge significantly prolonged the survival time of rats exposed to an acceleration of plus 15 g, in comparison with the untrained, control group. Z.W.

A69-41386 *
SOME OBSERVATIONS ON THE SODIUM AND POTASSIUM INTERACTIONS IN THE BLUE-GREEN ALGA ANABAENA FLOS-AQUAE A-37.
C. D. Bostwick, L. R. Brown, and R. G. Tischer (Mississippi State University, State College, Miss.).
Physiologia Plantarum, vol. 21, 1968, p. 466-469. 7 refs.
Grant No. NGR-25-001-004.

The growth of *Anabaena flos-aquae* A-37 is shown to be severely limited by the absence of either sodium or potassium from the culture medium. Neither element is capable of replacing the other. The addition of sodium to sodium-starved cell restores growth, while potassium-starved cells are not affected by the addition of potassium. (Author)

A69-41387 *
THE ELECTRODIALYSIS OF ANABAENA FLOS-AQUAE A-37.
R. G. Tischer, C. D. Bostwick, J. C. Mickelson, and L. R. Brown (Mississippi State University, Dept. of Microbiology, State College, Miss.).
Biochimica et Biophysica Acta, vol. 156, 1968, p. 403-406. 9 refs.
Grant No. NGR-25-001-004.

Description of a method for the electrolytic depletion of ions from *Anabaena flos-aquae* A-37. The electrolytic depletion of positive Na, K, Ca, and Mg ions was determined to be 96.4, 64.4, 50.0, and 5.4 per cent, respectively. The alga survived the electrolytic treatment to the extent of from 40 to 50 per cent. From these data, it is suggested that the electrodialysis method described is a workable research tool for the removal of ions from the organism. (Author)

A69-41402
RADIATION SENSITIVITY OF BACTERIOPHAGE DNA. I–BREAKS AND CROSS-LINKS AFTER IRRADIATION IN VITRO (STRAHLENEMPFINDLICHKEIT VON BAKTERIOPHAGEN-DNS. I–BRÜCHE UND VERNETZUNGEN NACH BESTRAHLUNG IN VITRO).
Thérèse Coquerelle, Leuthold Bohne, Ulrich Hagen (Karlsruhe, Kernforschungszentrum, Institut für Strahlenbiologie, Karlsruhe, West Germany), and Jürgen Merkwitz (Karlsruhe, Kernforschungszentrum, Institut für Neutronenphysik und Reaktortechnik, Karlsruhe, West Germany).
Zeitschrift für Naturforschung, Teil b, vol. 24b, July 1969, p. 885-893. 27 refs. In German.

Investigation of the desoxyribonucleic acid (DNA) degradation caused by gamma irradiation in vitro by Co 60 at a dose rate of 65,000 rad/hr. DNA isolated from Coli bacteriophage T1 was irradiated in 0.165M NaCl. The molecular weight was determined by measurements of the sedimentation coefficient and viscosity. The molecular weight of T1 DNA was found to be 32 million. After irradiation at a concentration of 200 microgram/ml, double breaks as well as intermolecular cross-links could be determined. The number of double breaks showed a rise with the dose that is best described as composed of a linear and a quadratic term. At low doses the cross-links increase linearly, the rate being approximately half that for the linear part of the double breaks. After higher doses, where most of the molecules are degraded, apparently no additional cross-links are produced. No cross-links were seen in DNA degraded by desoxyribonuclease. The influence of the DNA concentration on the degradation and the formation of cross-links is discussed. P.G.

A69-41403
A COMPARATIVE STUDY OF SOME CARDIOVASCULAR EFFECTS OF SOTALOL (MJ 1999) AND PROPRANOLOL.
Gunnar Åberg, Theodore Dzedin, Lennart Lundholm, Lisbeth Olsson, and Nils Svedmyr (AB Bofors Nobel-Pharma, Mölndal and Metabolic Div.; Göteborg, University, Dept. of Pharmacology, Göteborg, Sweden).
Life Sciences, vol. 8, Apr. 1, 1969, p. 353-365. 15 refs.
Research supported by the Swedish National Association Against Heart and Chest Diseases, the Swedish State Medical Research Council, and the Läkemedelsindustriföreningen.

Comparison of the toxicity and of the blocking action of sotalol and propranolol on some circulatory and cardiac effects of catecholamines. The relationship between intravenously infused doses of propranolol and sotalol which were equally potent in their adrenergic beta-receptor blocking properties was 1:3. Propranolol was found to be 6 to 20 times more toxic than sotalol under different experimental conditions and in different species of animals. P.G.

A69-41404 *
COMPENSATORY HYPERTROPHY AND PHENYLETHANOLAMINE N-METHYL TRANSFERASE (PNMT) ACTIVITY IN THE RAT ADRENAL.
Roland D. Ciaranello, Jack D. Barchas, and Joan Vernikos-Danellis (Stanford University, Dept. of Psychiatry, Stanford; NASA, Ames Research Center, Moffett Field, Calif.).
Life Sciences, vol. 8, Apr. 1, 1969, p. 401-407. 9 refs.
NIH Grant No. HD-02881; Contract No. NR-102-715; Grant No. NGR-05-020-168.

Investigation of the hypothesis that physiological as opposed to pharmacological conditions (exogenous adrenocorticotrophic hormone) might raise adrenal PNMT further in nonhypophysectomized rats. The data obtained show that enzyme activity increases 1.5 times over sham operated controls 40 days after surgery. It is noted that the possibility exists that chronic low levels of pituitary-adrenal stimulation might be more effective in increasing enzyme activity than acute, high levels. P.G.

A69-41405
GLUCOSE METABOLISM IN RAT LYMPHATIC TISSUES–EFFECTS OF ACUTE AND CHRONIC EXERCISE.
Michael P. Dieter (U.S. Public Health Service, National Institutes of Health, National Institute of Arthritis and Metabolic Diseases, Bethesda, Md.).
Life Sciences, vol. 8, May 1, 1969, p. 459-468. 28 refs.

Enzymatical study of the pathways of glucose metabolism in lymphatic tissues of immature rats during periods of exercise-induced, elevated corticosteroid secretion. Endogenous adrenocortical activity of trained or untrained rats was altered by severe exercise stress and was correlated with the pattern of lymphatic tissue enzyme responses. This pattern is interpreted as hormonally mediated regulatory mechanism to divert substrate from the hexose monophosphate shunt to glycolysis during periods of suboptimal lymphatic tissue growth. Z.W.

A69-41406 *
GROWTH OF NONCOLLAGEN-NITROGEN CONCENTRATION [NCN] IN AN ANTIGRAVITY MUSCLE AS INFLUENCED BY BODY MASS OF MICE.
Charles C. Wunder (Iowa, University, Dept. of Physiology and Biophysics, Iowa City, Iowa) and John W. C. Bird (Rutgers University, Dept. of Physiology and Biochemistry, New Brunswick, N.J.).
Life Sciences, vol. 8, July 15, 1969, p. 707-712. 8 refs.
NIH-NASA-supported research.

Results of measurements of the wet mass, dry mass, and noncollagen-nitrogen (NCN) content in the gastrocnemius muscle of white mice. Data show that the NCN content in this muscle is directly proportional to the 1/3 power of the body mass. This relationship is not influenced by age, suggesting that the NCN grows in proportion to the body mass to be supported against gravity relative to the cross-sectional area for muscular support. T.M.

A69-41427
POLAROGRAPHIC MEASUREMENT OF CRITICAL OXYGEN PRESSURES AT HEART MUSCLE SARCOSOMES (POLAROGRAPHISCHE MESSUNG KRITISCHER SAUERSTOFFDRUCKE BEI HERZMUSKELSARKOSOMEN).
H. Glossmann and M. Frimmer (Giessen, Universität, Institut für Pharmakologie und Toxikologie, Giessen, West Germany).
Zeitschrift für Naturforschung, Teil b, vol. 24b, Jan. 1969, p. 76-79. 10 refs. In German.

Determination of the critical oxygen pressure in highly diluted sarcosome suspensions by a method reported by Gleichmann and Lübbers (1960). Sarcosomes were obtained from the hearts of Wistar rats. The oxygen consumption of sarcosomes was determined at 22.5, 30, and 37 deg C. The dependence of critical oxygen pressures on the type of buffer used for the suspension and the effect of hemoglobin or myoglobin on the results were studied. G.R.

A69-41428
STUDIES ON THE CHEMISTRY OF LICHENS. VII–CHEMICAL INVESTIGATIONS OF THE LICHEN SPECIES LECANORA (ASPICILIA) MYRINII (FR.)NYL.
Yngve Johannes Solberg (Agricultural College of Norway, Chemical Research Laboratory, Vollebekk, Norway).
Zeitschrift für Naturforschung, Teil b, vol. 24b, Apr. 1969, p. 447-451. 16 refs.
Research supported by the Fridtj of Nansens Fond.

Chemical investigation of the Norwegian lichen species *Lecanora (Aspicilia) Myrinii* with regard to its content of aromatic lichen compounds, hydroxy fatty acids, soluble and bound sugars, and amino acids. Norstictic acid and a tetrahydroxy fatty acid have been isolated. In addition to these two compounds, free galactose, glucose, mannose, sucrose, fructose, and 33 ninhydrin-positive compounds were detected in a water extract. The polysaccharides and the protein part of the lichen material were determined after hydrolysis. Great amounts of glucosamine were found in the protein fraction. (Author)

A69-41429
RADIOPROTECTIVE EFFECT OF 5-AZACYTIDINE IN AKR MICE.
J. Veselý, R. Gostof, A. Čihák, and F. Šorm (Československá Akademie Věd, Ústav Organické Chemie a Biochemie, Prague, Czechoslovakia).
Zeitschrift für Naturforschung, Teil b, vol. 24b, Mar. 1969, p. 318-320. 18 refs.

The administration of 5-azacytidine to mice (AKR strain) prior to irradiation with a supralethal dose of X rays markedly reduces their mortality. In the pretreated animals, the number of blood leukocytes and of bone marrow nucleated cells is considerably higher than in the animals that have been only irradiated. It is supposed that the radioprotective effect of 5-azacytidine favorably influences the proliferation of the stem cells which are responsible for the repopulation of the bone marrow. (Author)

A69-41430
INTERACTION OF DNA WITH RIBOSOMES IN CELL-FREE PROTEIN SYNTHETIZING SYSTEMS OF CHLORELLA PYRENOIDOSA.
G. Galling (Göttingen, Universität, Pflanzenphysiologisches Institut, Göttingen, West Germany).
Zeitschrift für Naturforschung, Teil b, vol. 24b, Mar. 1969, p. 321-327. 25 refs.
Research supported by the Deutsche Forschungsgemeinschaft.

Discussion of experiments which indicate that DNA from various sources enhances the amino acid incorporation in cell-free systems from *Chlorella pyrenoidosa.* It is found that this stimulation is neither inhibited by actinomycin D nor by chloramphenicol or cycloheximide (actidione). In the presence of ribonuclease, some precipitable polypeptide is formed with DNA, although the endogenous incorporation is completely inhibited by ribonuclease. After sucrose density gradient centrifugation, polysomal aggregates of ribosomes with DNA are found. Electron micrographs of such polysomes show a direct association of the DNA molecule with several ribosomes. G.R.

A69-41431
INFLUENCE OF SLOW PROTONS ON INFECTIOUS DNA OF BACTERIOPHAGE ΦX174 (EINWIRKUNG VON LANGSAMEN PROTONEN AUF INFEKTIÖSE DNS DES BAKTERIOPHAGEN ΦX174).
Horst Jung and Klaus Kürzinger (Karlsruhe, Kernforschungszentrum, Institut für Strahlenbiologie, Karlsruhe, West Germany).
Zeitschrift für Naturforschung, Teil b, vol. 24b, Mar. 1969, p. 328-332. 20 refs. In German.

Discussion of experiments in which thin films of infectious DNA of bacteriophage ΦX174 were exposed to bombardment by slow protons. The differential inactivation cross section was determined for proton energies ranging from 0.8 to 50 keV. It is found that the inactivation cross section remains constant at proton energies higher than 5 keV. It reaches a shallow minimum at energies between 1 and 1.5 keV, increasing slightly at still smaller energies. It is shown that elastic collisions impair the ability of ΦX-174-DNA to give rise to intact bacteriophage in *E. coli* K12 spheroplasts. V.P.

A69-41432
RESPIRATORY RESPONSES OF THE CONSCIOUS DOG TO SEVERE HEAT STRESS.
J. R. C. Hales and J. Bligh (Agricultural Research Council, Institute of Animal Physiology, Cambridge, England).
Experientia, vol. 25, Aug. 15, 1969, p. 818, 819. 11 refs.

Study of the effects of severe heat stress on respiratory frequency, rectal temperature, blood gases, and blood pH of the conscious dog. It was found that upon exposure to a hot dry environment respiratory frequency increased 18-fold. When ambient humidity was raised, there was a further increase in respiratory frequency, which rose, within 10 min, to a peak rate before decreasing to a lower value. From the record of thoracic movements and visual observations it was evident that when respiratory frequency rose the depth of breathing decreased. G.R.

A69-41433
AN ELECTRON MICROSCOPICAL DEMONSTRATION OF THE PERMEABILITY OF CEREBRAL AND RETINAL CAPILLARIES TO IONS.
J. R. Casley-Smith (Adelaide, University, Dept. of Zoology and Dept. of Microbiology and Dept. of Botany, Adelaide, Australia).
Experientia, vol. 25, Aug. 15, 1969, p. 845-847. 25 refs.
Research supported by the Australian Research Council.

Investigation of the passage of ions through the cerebral and retinal barriers of Wistar rats, using the Prussian blue reaction technique. It was found that the junctions between the endothelial cells of cerebral and retinal capillaries are permeable to ions and, presumably, to other small molecules. G.R.

A69-41434 *
STIMULUS GENERALIZATION OF GRAVITY.
D. F. McCoy and K. O. Lange (Kentucky, University, Lexington, Ky.).
Journal of the Experimental Analysis of Behavior, vol. 12, Jan. 1969, p. 111-118. 11 refs.
Grant No. NsG-456.

In two experiments, squirrel monkeys were exposed to centrifugally generated artificial gravity and were trained to respond for food reinforcement at selected gravity (g) levels. The first experiment involved a single g value; in the second experiment, subjects were trained to discriminate among two or three g values. After training, generalization tests were administered over a 1.1 to 2.1-g range. Single-stimulus training yielded a linear relationship between percentage of responding and magnitude of gravity. Two-valued discrimination training produced gradient peaks. (Author)

A69-41436 *
CONTIGUITY OF BRIEFLY PRESENTED STIMULI WITH FOOD REINFORCEMENT.
Alan Stubbs (New York University, New York, N.Y.).
Journal of the Experimental Analysis of Behavior, vol. 12, Mar. 1969, p. 271-278. 11 refs.
Grant No. NsG-450.

Pigeons performed on second-order schedules of reinforcement consisting of four fixed-interval components. Only the terminal component ended with food. Performance was studied both when a brief stimulus followed the completion of each of the first three fixed intervals (brief-stimulus schedule) and when the stimulus was omitted (tandem schedule). Variations in the temporal contiguity of the last presentation of the stimulus and the presentation of food indicated that the shorter the delay, the greater was the enhancement of rate of responding in comparison with tandem performance. A positively accelerated pattern of responding within fixed-interval components was a function of the contiguity of the brief stimulus and reinforcement; this pattern was absent for all tandem-schedule performance. (Author)

A69-41437
CONTROLLING HUMAN FIXED-INTERVAL PERFORMANCE.
Harold Weiner (U.S. Public Health Service, Saint Elizabeths Hospital, Washington, D.C.).
Journal of the Experimental Analysis of Behavior, vol. 12, May 1969, p. 349-373. 24 refs.

Both high and relatively constant rates of responding without postreinforcement pauses and lower rates with pauses after reinforcement are produced by human subjects under fixed-interval (FI) schedules. Such FI rates and patterns may be controlled when subjects are provided with different histories of conditioning and different conditions of response cost (reinforcement penalties per response). Subjects with a conditioning history under ratio schedules typically produce high and relatively constant rates of responding under FI schedules; this responding does not change systematically with changes in FI value. In contrast, subjects with a history under schedules which produce little or no responding between reinforcements tend to pause after reinforcement and respond at low rates under FI schedules, whether or not they also have ratio conditioning histories; cost increases the likelihood of this type of performance. (Author)

A69-41438
CONTROL OF HUMAN VIGILANCE BY CONCURRENT SCHEDULES.
Thomas W. Frazier and Vincent E. Bitetto (U.S. Army, Walter Reed Army Institute of Research, Washington, D.C.).
Journal of the Experimental Analysis of Behavior, vol. 12, July 1969, p. 591-600. 9 refs.

Twenty four subjects were studied for ten one-hour sessions to determine whether the human observer's visual monitoring of individual meters in a complex display can be differentially controlled by concurrent scheduling of signals. Subjects were divided into two main groups of 12 each. One group was given fixed-interval, variable-interval, and differential-reinforcement-of-low-rates schedules. The second group was given fixed-interval, fixed-ratio, and differential-reinforcement-of-low-rates schedules. Test subjects were instructed only to detect as many signals as possible. Results indicated that observing responses to the individual meters corresponded to the temporal patterns known to be associated with the schedules for the group given fixed-ratio instead of variable-interval as a component schedule. The group given the variable-interval schedule in the three-schedule combination tended to exhibit the same pattern of viewing across each of the three meters during any given session. However, subsequent testing was performed on two more subjects over 64 sessions, by adding initial feedback of signal detection results and instructions concerning schedule construction. These results indicated that with knowledge of schedule construction and initial feedback of detection data, differential responding can be maintained efficiently over long periods of time by the combination including fixed-interval, variable-interval, and differential-reinforcement-of-low-rates schedules. (Author)

A69-41439
CONCURRENT FIXED-RATIO FIXED-INTERVAL PERFORMANCES IN ADULT HUMAN SUBJECTS.
Richard M. Sanders (Southern Illinois University, Carbondale, Ill.).
Journal of the Experimental Analysis of Behavior, vol. 12, July 1969, p. 601-604.
Research supported by the University of North Carolina; PHS Grant No. MH-07534.

Two undergraduate males worked for money on a button-pressing task associated with concurrent fixed-ratio fixed-interval schedules of reinforcement. Manipulations of the fixed-ratio requirement produced an interaction between the various fixed-ratio and fixed-interval performances. When the fixed ratio was small, more fixed-interval responding occurred per interval than when the fixed ratio was large. In general, the data were similar to those obtained with lower organisms except that no postreinforcement pause or ratio strain was seen. (Author)

A69-41440 *
HYPEROXIA COMPARED TO SURFACTANT WASHOUT ON PULMONARY COMPLIANCE IN RATS.
David L. Beckman and Harold S. Weiss (Ohio State University, College of Medicine, Dept. of Physiology, Columbus, Ohio).
Journal of Applied Physiology, vol. 26, June 1969, p. 700-709. 56 refs.
Grants No. NsG-295-62; No. NGR-36-008-004.

Air and saline pressure-volume (P-V) curves were run on lungs from 220-g rats after 60-66 hr in oxygen at 1 atm. Inflation and deflation were continuous: with air at 20 sec/cycle to 20 cm water and with saline at 0.8 ml/min to the air V. Total lung compliance (CL) was determined from the change in V of the air curves between 5-15 cm water, tissue compliance (Ctis) from the slopes of the saline curves, and compliance due to surface forces (Csurf) from 1/CL minus 1/Ctis. Lecithin in the lung transudate obtained by saline perfusion was used as an index of surfactant. Hyperoxia decreased lecithin by 62 per cent. Surfactant washout in controls decreased CL and Csurf similarly, but increased Ctis. Lecithin was highly correlated with either CL or Csurf. Oxygen thus lowered CL both by decreasing surfactant and by increasing tissue rigidity. (Author)

A69-41441
EFFECT OF INHALED CO_2 ON HEMORRHAGIC CONSOLIDATION DUE TO UNILATERAL PULMONARY ARTERIAL LIGATION.
L. Henry Edmunds, Jr. (California, University, Medical Center, Cardiovascular Research Institute and Dept. of Surgery, San Francisco, Calif.) and Jess C. Holm (Virginia Mason Research Center, Seattle, Wash.).

(American Heart Association, Scientific Sessions, 40th, San Francisco, Calif., Oct. 20-24, 1967.)
Journal of Applied Physiology, vol. 26, June 1969, p. 710-715. 33 refs.
PHS Grants No. HE-09681-02; No. HE-11231-01; No. HE-06285.

Study of the effect of inhaled CO_2 and intravenous isoproterenol on the hemorrhagic consolidation which occurs after left pulmonary artery ligation in dogs. After ligation, three groups of dogs inhaled 5-6 per cent carbon dioxide in air within an airtight box for 2, 5, or 10 days. A fourth group received a continuous infusion of isoproterenol for 5 days. Two groups served as controls. All dogs were killed 5 or 10 days postoperatively. Total lung capacity and lung weight were measured to assess the amount of hemorrhagic consolidation in left lungs. Volume-pressure relationships using gas and saline, minimal surface tension of lung extracts and endobronchial washings, and microscopic morphology were also studied. The amount of hemorrhagic consolidation was significantly reduced in animals that continuously breathed carbon dioxide and was somewhat reduced in animals that inhaled carbon dioxide for only 2 days after operation. Isoproterenol infusion did not decrease the amount of hemorrhagic consolidation in left lungs. Minimal surface tensions of lung extracts and washings of carbon dioxide-treated animals averaged 3.8 dynes/cm, and lung stability indices calculated from volume-pressure diagrams did not differ from those of right lungs. The data indicate that inhalation of 5-6 per cent carbon dioxide decreases alveolar hemorrhage and congestion after unilateral pulmonary arterial ligation. (Author)

A69-41442
MECHANICAL PROPERTIES OF THE LUNG IN EXPERIMENTAL PULMONARY EMPHYSEMA.
S. S. Park, I. P. Goldring, C. S. Shim, and M. H. Williams, Jr. (Yeshiva University, Albert Einstein College of Medicine and Chest Service, Unit for Research in Aging and Dept. of Medicine; Bronx Municipal Hospital Center, Dept. of Medicine, Bronx, N.Y.).
Journal of Applied Physiology, vol. 26, June 1969, p. 738-744. 15 refs.
NIH Grants No. IR01-HE-08519-05; No. 5 T1-HE-5446-09; No. HD-00674; PHS Grant No. OH-00225-03.

The effect of pulmonary emphysema on expiratory flow limitation was studied by obtaining a static pressure-volume curve and flow-volume curves during natural and forced deflation on lungs excised from 31 normal Syrian golden hamsters and 39 hamsters treated with papain. The lungs treated with papain showed varying degrees of emphysema associated with an increase of lung compliance. However, the airway resistance during natural deflation was unaffected. The maximal flow for a given lung volume was inversely related to the lung compliance, and was comparable to the maximal flow in normal lungs obtained at a lower lung volume with comparable lung recoil force. The moderate flow limitation in the emphysematous lungs was considered largely a result of the reduced lung recoil force. (Author)

A69-41443
ENERGY UTILIZATION IN INTERMITTENT EXERCISE OF SUPRAMAXIMAL INTENSITY.
R. Margaria, R. D. Oliva, P. E. di Prampero, and P. Cerretelli (Milan, University, Dept. of Physiology, Milan, Italy).
Journal of Applied Physiology, vol. 26, June 1969, p. 752-756. 9 refs.
Research supported by the Consiglio Nazionale delle Ricerche.

In supramaximal exercise, the extra energy which is not met by oxidation is drawn from splitting of high-energy phosphate; only when this source is exhausted is energy drawn from the other anaerobic source, the splitting of glycogen into lactic acid. In strenuous intermittent exercise, no lactic acid is formed if the oxygen debt contracted during the working period can be met completely by the alactic phosphagen-splitting mechanism; the oxygen debt contracted during the working period must then be completely paid during the rest period. If these conditions are met, very heavy intermittent exercise can be carried out indefinitely, leading to a total amount of work much greater than would have been possible were the exercise protracted continuously until exhaustion. The payment of the alactic oxygen debt fraction is confirmed to be a fast process, the half-reaction time being about 20-25 sec. The capacity of this mechanism in young fit nonathletic subjects is about 20 ml/kg body weight. (Author)

A69-41444
TELEMETERED HEART RATE RESPONSE TO SELECTED COMPETITIVE SWIMMING EVENTS.
John R. Magel, William D. McArdle, and Roger M. Glaser (New York, City University, Queens College, Dept. of Health and Physical Education, Flushing, N.Y.).
Journal of Applied Physiology, vol. 26, June 1969, p. 764-770. 46 refs.
NSF Grant No. GU-2370.

Heart rate response prior to, during, and in recovery from selected competitive swimming events was determined in seven male members of the Queens College varsity swimming team by means of radiotelemetry. The swimming events studied were the 50-, 100-, 200-, 500-, and 1,000-yard swims. The heart rate increased rapidly during the initial stages of each race and then climbed progressively toward maximum as the race proceeded. Several plateaus in heart rate and swimming speed were reached during the 500- and 1,000-yard events. The longer swimming events tended to elicit higher peak heart rates (181 beats/min) than the shorter, sprint events (173 beats/min). Recovery from the 50-yard event was more rapid than any of the longer distances. In an attempt to account for the effects of work duration when comparing heart rates running and swimming, all subjects ran distances comparable in time to those they had swum. The pattern of heart rate response in running was essentially similar to swimming, but the magnitude of the response was greater in all running events. The maximum heart rates during running were significantly greater than those obtained during swimming for a similar time period. (Author)

A69-41445
INFLUENCE OF RESPIRATION, STROKE VOLUME, AND HEART RATE ON PULMONARY CAPILLARY PULSATILITY.
Nathan Segel (California, University, Cardiovascular Research Institute) and Malcolm B. McIlroy (San Francisco Medical Center, San Francisco, Calif.).
Journal of Applied Physiology, vol. 26, June 1969, p. 771-779. 20 refs.
PHS Grant No. HE-06285.

Pulmonary capillary blood flow was measured by the body plethysmograph nitrogen monoxide method in normal subjects during slow inspiration and expiration in the sitting 45 deg tilt, and supine positions, with and without venous tourniquets on the limbs, and before and after intravenous atropine. Measurements were also made during tidal breathing in the sitting position. Pulmonary capillary blood flow, right ventricular stroke volume, peak systolic flow, and capillary pulse amplitude were all greater during inspiration than during expiration and also greater in the supine than in the sitting position. At the same time, both heart rate and end-diastolic flow were less during these maneuvers. Venous tourniquets virtually abolished these changes and atropine-induced tachycardia caused a marked rise in end-diastolic flow. A significant positive correlation was found between peak systolic flow and stroke volume and a significant negative correlation between end-diastolic flow and the reciprocal of heart rate in all data from 12 subjects. (Author)

A69-41446
REFLEX RESPONSES OF HUMAN SWEAT GLANDS TO DIFFERENT RATES OF SKIN COOLING.
Mukul R. Banerjee, Reynaldo Elizondo, and Robert W. Bullard (Indiana University, Dept. of Anatomy and Physiology, Bloomington, Ind.).
Journal of Applied Physiology, vol. 26, June 1969, p. 787-792. 14 refs.

Army-supported research; Contract No. AF 44(620)-68-C-0014.

Reflex responses of the sweat glands to regional cooling of a skin area were studied on male human subjects resting in a hot room. The lower leg placed in a water bath was isolated for 15-min periods by arterial occlusion to establish the neural nature of the generalized sweating response. The effects on sweat gland activity of altering the magnitude and rate of temperature decrease of the water, as well as the size of the skin area cooled, were studied. The characteristic response to a step decrease in bath temperature was a sharp depression in sweating followed shortly after the bath temperature stabilized by a reversal, with recovery toward the initial sweating levels. Depression in generalized reflex sweating due to cooling of the lower leg was directly related to the magnitude of temperature change, the rate of temperature decrease, and the size of the skin area stimulated. For the same magnitude of temperature decrease, the depression in sweating was inversely related to the overall thermal drive of the subject. The reflex sweating activity associated with cooling of a skin area could be explained largely on the basis of rate response of thermosensitive nerve fibers to temperature changes. (Author)

A69-41447 *
MECHANISMS OF INJURY DUE TO INTENSE $\pm G_z$ VIBRATION IN WATER-IMMERSED CATS.
Donald J. Sass (National Naval Medical Center, Naval Medical Research Institute, Bethesda, Md.).
Journal of Applied Physiology, vol. 26, June 1969, p. 819-826. 17 refs.
NASA Contract No. R-10.

Description of the pattern and developmental sequence of injury in cats produced by intense sinusoidal vibration along the long axis of the body. Anesthetized cats were positioned upright in a water-immersion restraint and vibrated in the long axis of the body with vertical sinusoidal motion. Frequency and peak acceleration varied between 3.5 and 20 Hz, and plus and minus 1 and 15 G, respectively. Exposures at 4 G or less were for 30 min, but at the higher accelerations the time ranged between 15 sec and 30 min. Autopsies were performed immediately after vibration. The major injury occurred in the lung, and resembled lung injury due to blast, impact deceleration, and chest wall impact. The common mechanism seems to be excessive transpulmonic pressure resulting from abrupt change in thoracic volume. In an earlier investigation in this laboratory, supine cats were subjected to vibration in a water-immersion restraint. Pulmonary collapse and hemorrhage were the major injuries and were attributed to the heart pounding the lungs against the chest wall. Comparison of the results of the two studies indicates that body position in relation to the direction of vibration is a critical factor in the mechanism of vibration injury. (Author)

A69-41448
EFFECT OF ACCELERATION ON REGIONAL LUNG EMPTYING.
J. G. Jones, S. W. Clarke, and D. H. Glaister (Royal Air Force, Institute of Aviation Medicine, Farnborough, Hants.; Queen Elizabeth Hospital, Dept. of Medicine, Birmingham, England).
Journal of Applied Physiology, vol. 26, June 1969, p. 827-832. 19 refs.
Research supported by the Medical Research Council and the United Birmingham Hospitals.

The single-breath test of Fowler was modified to produce wide regional differences in lung nitrogen concentration, by inspiration of a small volume of air at residual volume into nitrogen-free lungs. The subsequent pattern of sequential lung emptying at varying expiratory flow rates was studied in three normal subjects at increasing levels of acceleration up to plus 4 G_z, by continuous analysis of the expired nitrogen. At slow expiratory flow rates there was a marked terminal rise in nitrogen concentration over the last 15-20 per cent of the vital capacity. This rise and the proportion of the vital capacity over which it occurred increased with added acceleration, indicating closure of basal airway units at a progressively higher lung volume. With increasing expiratory flow rate, the closure of basal airway units at higher accelerations was enhanced. It was predicted that there would be virtually no gas trapping at 0 G, but a large volume at plus 9 G acceleration. Added acceleration changes lung emptying, and leads to increasing inequalities of ventilation and perfusion. (Author)

A69-41449 #
ELECTRIC-FIELD DISTURBANCES NEAR THE HUMAN BODY.
Philip C. Richardson and Robert M. Adams (USAF, Aerospace Medical Div., School of Aerospace Medicine, Brooks AFB, Tex.).
Journal of Applied Physiology, vol. 26, June 1969, p. 838-840.
Grant No. AF AFOSR 766-67.

Small oscillatory electric-field disturbances occur near the human body concurrent with each heart beat and respiration. An investigation of the sources of these field changes revealed the signals to be unrelated to blood flow or streaming potentials. A charged body-proximity hypothesis is suggested. (Author)

A69-41450 #
A PUMP SYSTEM FOR PERFORMING INDICATOR-DILUTION CURVES WITHOUT BLOOD LOSS.
Joseph D. Cohn (USAF, Aerospace Medical Research Laboratories, Wright-Patterson AFB, Ohio).
Journal of Applied Physiology, vol. 26, June 1969, p. 841-843. 7 refs.

Description of a method by which indocyanine green dye-dilution curves are obtained without blood loss. Inflow arterial blood is circulated past a densitometer cuvette and returned to the subject through an outflow cannula by means of a roller-pump system. This system may be used for performing indicator-dilution studies in small animals and infants where blood sampling must be kept to a minimum. (Author)

A69-41451 *
CALIBRATION OF CLARK OXYGEN ELECTRODE FOR USE IN AQUEOUS SOLUTIONS.
M. E. LeFevre (New York, City University, Mount Sinai School of Medicine and Graduate School, Dept. of Physiology and Div. of Biophysics, New York; Brookhaven National Laboratory, Medical Research Center, Upton, N.Y.).
Journal of Applied Physiology, vol. 26, June 1969, p. 844-846.
NASA-AEC-supported research; NIH Grant No. AM 13037; NSF Grant No. GB-7764.

Description of a rapid and simple method for the preparation of oxygen standard solutions for use with the oxygen electrode. The method involves the mixing of two solutions, one equilibrated with 100 per cent oxygen, the other with 100 per cent nitrogen. The electrode response in water equilibrated with known oxygen-nitrogen gas mixtures was found to be indistinguishable from the response obtained in mixed solutions calculated to give the same per cent oxygen saturation. The method was applied to the preparation of solutions for multipoint calibrations of the Clark electrode, and was shown to be reliable and accurate. Its application to the testing of electrodes is illustrated by analysis of the performance of a defective electrode and its repair by ammonium hydroxide treatment. (Author)

A69-41453
AN INVESTIGATION INTO THE EFFECT OF EXERCISING PARTICULAR LIMB-SEGMENTS UPON PERFORMANCE IN A TRACKING TASK.
M. Hammerton and A. H. Tickner (Medical Research Council, Applied Psychology Research Unit, Cambridge, England).
Ergonomics, vol. 12, Jan. 1969, p. 47-49.

Investigation of the effect of exercising particular limb segments on skill in an acquisition tracking task. To carry out the task, the operator used his thumb to operate a small joystick. Two sorts of exercise were employed: one used the muscles of the whole hand, while the other used principally those of the thumb. It was found that the latter produced a marked, though transient, decrement in performance, whereas the former did not. It appears that, for tasks of this type and order of difficulty, serious decrement in per-

formance is only to be expected when highly specific muscle groups are exercised. Normal work loads and activities should therefore not constitute a hazard. O.H.

A69-41454
THE EFFECT OF SIGNAL CHARACTERISTICS ON REACTION TIME USING BISENSORY STIMULATION.
A. D. Perriment (Monash University, Clayton, Victoria, Australia).
Ergonomics, vol. 12, Jan. 1969, p. 71-78. 5 refs.

Sixty-four subjects were tested to examine the effect upon reaction time of the composition of bisensory signals simultaneously presented in two sensory modes. The stimulus display consisted of a flash of light from one of two lamps and a 1000 Hz tone presented at one or other earphone of a binaurally balanced headset. Subjects responded by depressing push buttons. The three response code variables examined were the code carried by each of the operating limbs, the code carried by the operating digits of each hand, and the degree of separation between the button pairs. Signals were classified as either unilateral, both components of the audio-visual signal originating on the same side of the body midline, or bilateral, the separate components originating contralaterally. Clear and consistent differences in the reaction times given to unilateral and bilateral signals were found. An explanatory attempt in terms of differential cortical stimulation is considered, and rejected. An alternative explanation involving "spatial expectancy" is offered and found to have limitations. (Author)

A69-41455 *
CONNECTION BETWEEN A MITOCHONDRION AND ENDOPLASMIC RETICULUM IN LIVER.
J. J. Ghidoni and H. Thomas (Baylor University, College of Medicine, Dept. of Pathology, Laboratory of Experimental Pathology, Houston, Tex.).
Experientia, vol. 25, June 15, 1969, p. 632, 633. 11 refs.
NASA-supported research; PHS Grants No. RH-00499; No. HE-05435.

Investigation of the interconnection between endoplasmic reticulum and mitochondria in hepatocytes and of an observed instance of continuity between these organelles in irradiated rhesus liver. It is shown that this continuity may take the form of active transport of molecules out of the reticulum, diffusion across the cytoplasmic gap, and then active absorption of the protein into the mitochondrion. Evidence is presented suggesting the existence of a direct connection between rough endoplasmic reticulum and mitochondria in rhesus hepatocytes. It is noted that in this instance it may be a pathological alteration in an irradiated cell, although the data can hardly be interpreted as suggesting that the connection is secondary to the irradiation. P.G.

A69-41456
REGULATION OF LEUCINE INCORPORATION INTO CARDIAC PROTEIN BY WORK LOADS.
K. Kako and R. Minelli (Ottawa, University, Dept. of Physiology, Ottawa, Canada).
Experientia, vol. 25, Jan. 15, 1969, p. 34-36. 20 refs.
Research supported by the Medical Research Council, the Bickell Foundation, and OHF.

Investigation of the mechanism of cytoplasmic protein synthesis. By using a heart-lung preparation of rats in which a precise control of the hemodynamic parameters is possible, it is shown that cytoplasmic protein synthesis varies directly with a change in cardiac work level. A fourfold increase in cardiac work load results in a 50 per cent increase in leucine incorporation. Upon addition of puromycin and cycloheximide, the control of synthesis was inhibited. It is therefore postulated that the site regulating amino acid incorporation is at the level of the membrane-ribosome complex. P.G.

A69-41457 *
AGREEMENT IN ENDPOINTS FROM CIRCADIAN RHYTHMOMETRY ON HEALTHY HUMAN BEINGS LIVING ON DIFFERENT CONTINENTS.
F. Halberg, June Reinhardt, F. C. Bartter, Catherine Delea, R. Gordon, A. Reinberg, J. Ghata, M. Halhuber, H. Hofmann, R. Günther, E. Knapp, J. C. Pena, and M. Garcia Sainz (Minnesota, University, Dept. of Pathology, Minneapolis, Minn.).
Experientia, vol. 25, Jan. 15, 1969, p. 107-112. 33 refs.
PHS Grant No. CA-5-KG-GM-13981; Grant No. NGR-24-005-006.

Analysis of some characteristics of circadian rhythms as reference standards for comparing investigation data from different continents. Circadian acrophases, defined as crests of an approximately 24-hour periodicity, of blood corticosteroids, urine corticosteroids, potassium in urine, body temperature, and pulse rate have been determined by means of a computer program providing a least-squares fit of harmonic functions. The interpretation and application of the results obtained are discussed. It is shown that acrophases agree remarkably well in studies carried out by different investigators working many years and miles apart with differing biophysical, biochemical, and behavioral methodology, under dissimilar standardization of the conditions chosen for observation, and of the kind and extent of sampling. P.G.

A69-41458
EFFECT OF TENSION UPON RATE OF INCORPORATION OF AMINO ACIDS INTO PROTEINS OF CROSS-STRIATED MUSCLE.
M. Burešová, E. Gutmann, and M. Klicpera (Československá Akademie Věd, Fysiologický Ústav, Prague, Czechoslovakia).
Experientia, vol. 25, Feb. 15, 1969, p. 144, 145. 7 refs.

Comparison of the rate of incorporation of ^{14}C-leucine into the proteins of two cross-striated muscles of rats using stretched and unstretched preparations. It is shown that incorporation of ^{14}C-leucine into proteins in stretched muscles is considerably higher than into the proteins of muscles freely incubated. The possible mechanism of this increase of incorporation is discussed. Z.W.

A69-41459
A RELATION BETWEEN POSITIVE PHASE SHIFT AND ELASTIC MODULUS ENHANCEMENT OF SMOOTH MUSCLE.
Julia T. Apter (Presbyterian-St. Luke's Hospital, Chicago, Ill.) and W. Graessley (Northwestern University, Evanston, Ill.).
Experientia, vol. 25, Feb. 15, 1969, p. 145-147. 9 refs.
PHS Grant No. GM-14659-02.

Study of the relation between positive phase shift and elastic modulus enhancement of smooth muscles removed from the urinary bladder, pulmonary artery, and large veins of anesthetized rabbits, cats, and dogs. It is shown that low-frequency oscillatory strains induce a net increase in the contractile tone of smooth muscles, resulting in levels of tensile moduli which equal or even exceed those produced by drugs or electrical stimulation. Z.W.

A69-41460
REFLEX ACTIVITY OF SINGLE PREGANGLIONIC SYMPATHETIC FIBRES DURING CORONARY OCCLUSION.
A. Malliani, P. J. Schwartz, and A. Zanchetti (Milano, Università, Istituto di Ricerche Cardiovascolari, Milan, Italy).
Experientia, vol. 25, Feb. 15, 1969, p. 152, 153. 11 refs.
Research supported by the Consiglio Nazionale delle Ricerche.

Study of the reflex activity of single preganglionic sympathetic fibers during coronary occlusion, giving particular attention to the activity of the left third thoracic (T3) ramus communicans. It is concluded that T3 sympathetic fibers, probably related to the efferent innervation of the heart, are frequently activated by coronary occlusion. Z.W.

A69-41461
CARDIAC MUSCLE—CHANGES IN OPTIMAL LENGTH DURING INOTROPIC INTERVENTIONS.
H. J. Bartelstone, B. F. Hoffman (Columbia University, College of Physicians and Surgeons, Dept. of Pharmacology, New York, N.Y.), and A. L. Bassett.
Experientia, vol. 25, Feb. 15, 1969, p. 153, 154. 8 refs.
PHS Grant No. HE-10282.

Summary of the results of 17 experiments on cat papillary muscles, including a comparison between the length-tension curves obtained before and after an inotropic intervention. In nine of these experiments there was a significant change in optimal length—i.e., after the inotropic intervention the maximum tension developed during isometric contraction was recorded at a muscle length and resting tension remarkably different from the control values. Z.W.

A69-41462
BODY WEIGHT AND ORGAN SIZES IN WARMTH-ADAPTED AND IN COLD-ADAPTED, HIBERNATING GOLDEN HAMSTERS.
J. H. Smit-Vis (Amsterdam, University, Anatomical-Embryological Laboratory, Amsterdam, Netherlands) and G. J. Smit (Central Institute for Brain Research, Amsterdam, Netherlands).
Experientia, vol. 25, Feb. 15, 1969, p. 156-158. 7 refs.

Study of the body weight and organ sizes in golden hamsters which were kept on hibernation in a long-term experiment. These data are compared with those obtained in adequate controls. A statistically significant increase in the weight of the lungs, heart, kidney, pancreas, and liver is found in the hibernating animals. With regard to the weights of the testes, skin, and femora, no significant differences were found between the two series of animals. Z.W.

A69-41463
POST-INHIBITORY REBOUND OF THE b-WAVE OF THE PIGEON ERG.
B. J. Frost (California, University, Dept. of Physiology, Berkeley, Calif.).
Experientia, vol. 25, Mar. 15, 1969, p. 260, 261. 6 refs.
Defence Research Board of Canada Grant No. 9425,08.

Investigation of adaptation processes in the pigeon visual system. The experimental method consisted in presenting a flickering light to the pigeon's right eye until the electroretinograms so produced were of constant magnitude. The results obtained indicate that bipolar cells are inhibited during light adaptation, since a postadaptation rebound effect occurs in the b-waves of the electroretinograms. P.G.

A69-41464
SOME EFFECTS OF LASER UPON THE BONES.
J. Kolár (Karls-Universität, Radiologische Klinik, Prague, Czechoslovakia), A. Babický (Československá Akademie Věd, Isotopová Laboratoř, Prague, Czechoslovakia), and J. Blabla (Československá Akademie Věd, Ústav Radiotechniky a Elektroniky, Prague, Czechoslovakia).
Experientia, vol. 25, Apr. 15, 1969, p. 365, 366. 8 refs.

Study of the effects of laser pulses on the bones of male Wistar rats. Distinct metabolic deviations in the 48-hr Ca 45 uptake in the bones, lasting several months, were found in rats which had been subjected to three laser pulses with an energy of 9 J. G.R.

A69-41465
IMPULSE RESPONSES OF THE NERVUS OPTICUS TO EXCITATION OF THE RETINA WITH ACETYLCHOLINE (IMPULSANTWORTEN DES NERVUS OPTICUS AUF REIZUNG DER NETZHAUT MIT ACETYLCHOLIN).
J. Trifonow (Akademiia Nauk SSSR, Institut Problem Peredachi Informatsii, Moscow, USSR), M. A. Ostrowski (Akademie der Wissenschaften, Institut für Höhere Nerventätigkeit und Neurophysiologie, Moscow, USSR), and P. Dettmar (Leipzig, Universität, Physiologisches Institut, Leipzig, East Germany).
Experientia, vol. 25, Apr. 15, 1969, p. 370, 371. 9 refs. In German.

Discussion of spikes of the optic nerve elicited by the application of acetylcholine (ACh) on the isolated perfused retina of the frog. The extent of this spike activity depended on the amount of ACh applied. The retinal response to ACh was varied by prostigmine and atropine, as expected by their pharmacological properties. From these experiments it cannot be concluded that ACh acts on the synapses of the firing ganglion cells directly. G.R.

A69-41466
EFFECT OF D-AMPHETAMINE ON THE ACTIVITY OF SINGLE NEURONS OF THE CAT'S TECTUM OPTICUM.
M. Straschill and K. P. Hoffmann (Max-Planck-Institut für Psychiatrie, Munich, West Germany).
Experientia, vol. 25, Apr. 15, 1969, p. 373. 7 refs.

Discussion of tests in which recordings with steel-microelectrodes from single tectal neurons were made before and after intravenous injection of D-amphetamine. It was found that D-amphetamine increased the excitability of tectal neurons and prevented or diminished neuronal adaptation to repeated stimulation. G.R.

A69-41467
NUMERICAL CAPACITIES OF CEREBELLAR CELL AND FIBER SYSTEMS.
J. Tomasch (Pahlavi University, Dept. of Anatomical Sciences, Shiraz, Iran).
Experientia, vol. 25, Apr. 15, 1969, p. 377, 378. 10 refs.

Discussion of the number of cells and fiber systems of the human cerebellum. The information transfer capacity of the afferent and efferent cell systems and fiber tracts of the cerebellum has been numerically defined with regard to problems of cybernetics. G.R.

A69-41468
LONG-TERM CHANGES IN RETINAL FUNCTION INDUCED BY SHORT, HIGH INTENSITY FLASHES.
B. Knave (Royal Caroline Institute, Dept. of Physiology II, Stockholm, Sweden).
Experientia, vol. 25, Apr. 15, 1969, p. 379, 380. 14 refs.
Research supported by the Karolinska Institutet and the Swedish Medical Research Council; Grant No. AF EOAR 66-34.

Discussion of experiments in which it is shown that electronic light flashes are followed by reversible long-term changes in the ERG. It was found that an electronic light flash with an intensity of about seven logarithmic units above the threshold value of the b-wave produces a significant decrease in the b-wave amplitude of the dark-adapted eye. G.R.

A69-41469
CEREBROSPINAL FLUID PRODUCTION DURING TEMPERATURE STRESS AND FEEDING IN THE CONSCIOUS MONKEY.
R. D. Myers and L. G. Sharpe (Purdue University, Laboratory of Neuropsychology, Lafayette, Ind.).
Experientia, vol. 25, May 15, 1969, p. 497, 498. 6 refs.
NSF Grant No. GB-7906; Contract No. N 00014-67-A-0003.

Study of the rate of formation of cerebrospinal fluid (CSF) during temperature stress (cooling to -5 to -10 deg C or heating to 50 to 55 deg C) and feeding in six male rhesus monkeys. A reduction of the CSF flow rate was found under the conditions investigated. Following cooling or heating, recovery of normal CSF production did not usually occur until 30 min after exposure to the temperature stress was terminated. G.R.

A69-41470
CHANGES IN THE LUMEN OF CORONARY VESSELS UNDER OLIGEMIC HYPOTENSION.
V. I. Ovsiannikov and B. I. Tkachenko (Institute of Experimental Medicine, Laboratory for Circulation, Leningrad, USSR).
Experientia, vol. 25, May 15, 1969, p. 501-503. 9 refs.

Study of the possibility of active changes of coronary vessel lumen under hypotension resulting from a decrease in the circulating blood volume in cats. It was found that the decrease of circulating blood volume, resulting in oligemic hypotension, may evoke in an anesthetized cat active constrictory coronary vessel responses of two types, one occurring immediately after start of the hypotension, while the other has a significantly prolonged latency. G.R.

A69-41471
RHYTHMIC WAVELETS RECORDED FROM AN IN VITRO PREPARATION OF MAMMALIAN RETINA.
Y. Honda (Kyoto University, Dept. of Ophthalmology, Kyoto, Japan).
Experientia, vol. 25, May 15, 1969, p. 551-553. 15 refs.

Description of rhythmic wavelets recorded from an *in vitro* preparation of a rabbit retina. A typical electroretinogram is presented, which shows a dominant a-wave and a b-wave of relatively low voltage, as compared with those *in vivo*, and the ascending phase of a c-wave. There are four distinct rhythmic wavelets in the ascending phase of the b-wave. The frequency of these wavelets is about 200 cps and is approximately equal to that of the oscillatory potential on rabbit ERG *in vivo*. G.R.

A69-41472
EVOKED RELEASE OF 5-HT AND NEFA FROM THE HYPOTHALAMUS OF THE CONSCIOUS MONKEY DURING THERMOREGULATION.
R. D. Myers (Purdue University, Laboratory of Neuropsychology, Lafayette, Ind.), A. Kawa (Kagoshima University, First Dept. of Internal Medicine, Kagoshima, Japan), and D. B. Beleslin (Belgrade, University, Faculty of Medicine, Dept. of Pharmacology, Belgrade, Yugoslavia).
Experientia, vol. 25, July 15, 1969, p. 705, 706. 10 refs.
Research supported by the Wallace Laboratories; NSF Grant No. GB-7906; Contract No. N 00014-67-A-0226-0003.

Investigation of the potent chemical factors released from the anterior hypothalamus of rhesus monkeys in response to thermal stress. It was found that cooling of the animal (0 to -10 deg C) caused an increase in 5-HT release within the anterior hypothalamus from 4- to 24-fold. Heating (50 to 55 deg C) usually failed to affect the resting level of 5-HT. The resting level of the NEFA-like substance released from the anterior or posterior hypothalamus remained practically unchanged during cooling but increased significantly during heating and remained elevated for 1 to 2 hours after heating was terminated. It is concluded that at least two substances are released reciprocally within the hypothalamus of the warm and cold monkey. P.G.

A69-41473
THE CONSTITUENTS OF ARTERIAL PRESSURE CHANGE.
J. Iriuchijima (Tokyo, University, Institute for Medical Electronics, Tokyo, Japan).
Experientia, vol. 25, July 15, 1969, p. 713, 714.

Formulation of equations determining quantitatively the relative values of the two constituents of the arterial pressure change—namely, the cardiac output and the systemic peripheral resistance. The application of the derived equations is demonstrated by two examples in which experimental blood pressure changes in dogs were evaluated. P.G.

A69-41479
THE INEVITABLE APPEARANCE OF PROTOCELLS ON THE PRIMITIVE EARTH.
Adolph E. Smith, Claude Galand, and Krishna Bahadur (Sir George Williams University, Physics Dept., Montreal, Canada).
Spaceflight, vol. 11, Sept. 1969, p. 325. 18 refs.
Research supported by the National Research Council.

Assessment of the possibility of the appearance of biochemical microspheres under various hypothetical primitive earth conditions starting from various simple compounds. It is concluded that the formation of cell-like structures containing biochemicals may be considered an inevitable event, given any one of the presently conceived primitive earth conditions. The chief outstanding problem in origin-of-life work is now shifted from the synthesis of single molecules to a study of how these primitive microstructures interacted with the environment and the origin of metabolic processes. O.H.

A69-41494
TRANSIENT TESTING OF MAN.
J. N. Macduff (Duke University, Durham, N.C.).
Sound and Vibration, vol. 3, Aug. 1969, p. 16-21.

Discussion of the general concept of the testing and data analysis procedure used in transient testing of a standing man to obtain an engineering estimate of the frequency and unit impulse response. A description is given of the man test stand, the measurement system, and the method of applying the Welch correction for the instrument dynamics. Calculation of the correct velocity is demonstrated by computing the Welch velocity and by using a large-time asymptote as a base line. Test results on a standing man and an elementary model of a standing man are presented. Z.W.

A69-41495
SIL—PAST, PRESENT, AND FUTURE.
John C. Webster (U.S. Naval Electronics Laboratory Center, San Diego, Calif.).
Sound and Vibration, vol. 3, Aug. 1969, p. 22-26. 32 refs.

Review of the speech-interfering aspects of noise in terms of the level and spectrum of speech and noise at the listener's ear. A summary of major experimental results of noise measurements in terms of range and standard deviation in decibels is presented. A new procedure is proposed for measuring the speech interference level. This procedure is based on the PSIL (average of the octave-band levels centered at 500, 1000, and 2000 Hz) or A-weighted sound level and the distance between communicators. A nomogram is presented which simplifies the application of this technique. Z.W.

A69-41573 #
SOME PROBLEMS IN THE MEASUREMENT OF COCHLEAR DISTORTION.
P. Dallos, Z. G. Schoeny, D. W. Worthington, and M. A. Cheatham (Northwestern University, Auditory Research Laboratory, Evanston, Ill.).
Acoustical Society of America, Journal, vol. 46, Aug. 1969, pt. 2, p. 356-361. 6 refs.
NIH-supported research.

Proper specification of the magnitude and purity of the sound stimulus is of utmost importance in studies dealing with distortion processes in the ear. It is shown that, in general, sound pressure level (SPL) measurements in rigid-walled couplers do not provide adequate representation of sound levels observed at the experimental animal's eardrum. Similarly, the distortion generated by the experimental apparatus can be either over or underestimated if measured in couplers. Absolute specification of tolerable distortion level created by the experimental apparatus is not possible, and this level depends on various factors of the actual experiment. Evidence is presented that favors the prosecution of studies on auroral distortion with the auditory bulla closed. (Author)

A69-41574 #
DEPENDENCE OF THE COCHLEAR MICROPHONICS AND THE SUMMATING POTENTIAL ON THE ENDOCOCHLEAR POTENTIAL.
Vicente Honrubia and Paul H. Ward (California, University, School of Medicine, Dept. of Surgery, Los Angeles, Calif.).
Acoustical Society of America, Journal, vol. 46, Aug. 1969, pt. 2, p. 388-392. 14 refs.
Research supported by the Deafness Research Foundation and PHS.

The resting potential of the scala media (EP) in the first turn of the guinea pig's cochlea was altered by the application of currents. The EP, the cochlear microphonics (CM), and the summating potential (SP) were enhanced when the source electrode was in the scala media, whether the sink electrode was in the scala tympani or scala vestibuli. Using the scala media electrode as the sink for the current caused decreases in these potentials. When the EP change was sufficient to reverse the dc gradient across the reticular lamina, the CM reversed their polarity. A linear relationship exists between the changes in CM and EP. These results support the electromechanical theory of the production of microphonics. (Author)

A69-41600 *
THE GEMINI XI S-4 SPACEFLIGHT-RADIATION INTERACTION EXPERIMENT—THE HUMAN BLOOD EXPERIMENT.
M. A. Bender, P. C. Gooch, and S. Kondo (Oak Ridge National Laboratory, Biology Div., Oak Ridge, Tenn.).
Radiation Research, vol. 34, Apr. 1968, p. 228-238. 5 refs.
NASA-AEC-sponsored research.

Discussion of the results of some preliminary ground experiments and the S-4 blood experiment carried out during the Gemini 11 mission. The S-4 experiment, designed to test the hypothesis that a radiobiological synergism exists between ionizing radiation and some other parameter associated with space flight, used both single- and multiple-break chromosome aberrations as biological end points. These experiments showed that no increase in multiple-break aberration occurs when the cells are irradiated during flight. Unlike previous Gemini 3 results, however, the Gemini 11 results showed no significant increase in the yields of single-break aberrations induced by in-flight irradiation. It is concluded that the significant difference seen in the Gemini 3 experiment must have resulted from random sampling error and that the postulated synergism is not demonstrable for either class of human chromosome aberrations. P.G.

A69-41673
PHYSIOLOGICAL RESPONSE TO STEADY STATE HYPOXIA.
Lawrence E. Lamb, Roy J. Kelly, Wilbur L. Smith, Adrian D. LeBlanc, and Philip C. Johnson (Baylor University, College of Medicine, Dept. of Medicine, Houston, Tex.).
Aerospace Medicine, vol. 40, Sept. 1969, p. 943-951. 24 refs.
Research supported by the Jewish Institute for Medical Research; PHS Grant No. HE-05435.

Steady-state hypoxia was achieved by exposure to hypoxia for one hour. In a feasibility study, a posthypoxic paradox demonstrated the inadvisability of utilizing 10 per cent oxygen for this duration. Six subjects were evaluated with 12 per cent oxygen with atraumatic instrumentation and demonstrated minimal changes in heart rate and blood pressure. The changes noted in the ventilated air demonstrated the effect of the oxygen reservoir as a buffer system. Steady state hypoxia at safe levels requires only a minimal increase in cardiac output and consequently only a minimal increase in coronary blood flow. This explains the minimal effectiveness of hypoxia in testing the reserve capacity to increase coronary blood flow. (Author)

A69-41674 *
EFFECTS OF ANGULAR ACCELERATION ON MAN—THRESHOLDS FOR THE PERCEPTION OF ROTATION AND THE OCULOGYRAL ILLUSION.
Brant Clark (San Jose State College, San Jose, Calif.) and John D. Stewart (NASA, Ames Research Center, Moffett Field, Calif.).
Aerospace Medicine, vol. 40, Sept. 1969, p. 952-956. 32 refs.
Grant No. NGL-05-046-002.

Investigation of the sensitivity of normal human observers to angular acceleration about their yaw axis, using the perception of rotation and the oculogyral illusion as indicators. The data were obtained for 53 normal men, using a one-degree-of-freedom simulator that could produce angular accelerations with narrow limits of error. A forced-choice, random, double staircase method was used to present the 10-sec stimuli. Thresholds for the perception of rotation for these 53 men were found to vary from 0.05 to 2.20 deg per sec per sec with a mean of 0.41 deg per sec per sec. The thresholds for the oculogyral illusion for 32 men were significantly below these figures, the thresholds varying from 0.04 to 0.28 deg per sec per sec with a mean of 0.11 deg per sec per sec. These data show that normal men are extremely sensitive to angular acceleration about their yaw axis under optimum testing conditions. The results are discussed in relation to the psychophysiological mechanisms involved and to their implications for spatial orientation and the precision of control tasks in flight. (Author)

A69-41675 •
FLIGHT RESEARCH PROGRAM. XIV—LANDING PERFORMANCE IN JET AIRCRAFT AFTER THE LOSS OF BINOCULAR VISION.
Charles E. Lewis, Jr. and Gary E. Krier (NASA, Flight Research Center, Edwards, Calif.).
Aerospace Medicine, vol. 40, Sept. 1969, p. 957-963. 15 refs.

Thirteen pilots were studied in a T-33A jet trainer during a series of touch-and-go landings. Each flight included landing approaches with full binocular vision, followed by approaches with first the left and then the right eye covered. Both lateral and longitudinal miss-distance were photooptically measured from a specified touchdown point. Performance on final approach was analyzed with respect to airspeed control, sink rate, and the approach angle. Landing errors were clearly shown not to increase significantly during approaches made with one eye covered. The pilots were free to select any angle of descent during approach that they desired. Steeper approaches were consistently observed when vision was restricted to one eye than those flown with normal vision. One pilot was studied for three consecutive weeks during which his dominant eye was patched. Landing performance was analyzed during three flights (including thirty-five landings) and was compared with control data. Analysis of these data revealed no significant difference in landing performance with vision restricted to one eye over the entire period. (Author)

A69-41676
COCKPIT NOISE INTENSITY—FIFTEEN SINGLE-ENGINE LIGHT AIRCRAFT.
Jerry V. Tobias (Federal Aviation Administration, Civil Aeromedical Research Institute, Oklahoma City, Okla.).
Aerospace Medicine, vol. 40, Sept. 1969, p. 963-966. 6 refs.

Fifteen of the most popular single-engine general-aviation light aircraft were tested for the noise intensity present during normal cruising operations at 2000, 6000, and 10,000 ft. In comparison with currently accepted damage-risk criterion curves, the noise levels found even in the quietest plane tested could be damaging. However, a well fitted pair of earplugs should protect against the physiologically damaging noise intensities encountered in this study. (Author)

A69-41677
CLINICAL SIGNIFICANCE OF ACQUIRED COMPLETE RIGHT BUNDLE BRANCH BLOCK IN 59 PATIENTS WITHOUT OVERT CARDIAC DISEASE.
George K. Massing and Malcolm C. Lancaster (USAF, School of Aerospace Medicine, Clinical Sciences Div., Brooks AFB, Tex.).
Aerospace Medicine, vol. 40, Sept. 1969, p. 967-971. 9 refs.

Fifty-nine patients were examined who had a serial electrocardiographic change from normal conduction to right bundle branch block (acquired RBBB) without overt cardiac disease. The initial clinical and laboratory examinations failed to establish the etiology of the acquired RBBB in these patients. Information from follow-ups obtained a mean interval of 54.9 months from the discovery of RBBB revealed that only one patient developed symptoms suggestive of coronary heart disease. That one patient would have been disqualified from flying duties at the time of discovery of the RBBB because of marked hypertension. These data suggest it is possible to identify those patients with acquired RBBB who have a benign prognosis for at least a several year period. These patients are potentially salvageable for flying duties. (Author)

A69-41678
AN ATTEMPT TO PRODUCE ACCLIMATIZATION TO HYPOXIA BY INTERMITTENT ALTITUDE EXPOSURE WITH VIGOROUS EXERCISE.
H. S. Turner, G. W. Hoffler, C. E. Billings, and R. Bason (Ohio State University, Aviation Medicine Research Laboratory, Columbus, Ohio).

Aerospace Medicine, vol. 40, Sept. 1969, p. 971-976. 26 refs.
Contract No. DA-49-193-MD-2741.

Examination of the possibility that acclimatization to hypoxia could be produced by combining intermittent exposures to simulated altitude with exercise during the exposures. Three subjects performed strenuous exercise on a bicycle ergometer at 7500 ft simulated altitude, two hours daily, for seventeen consecutive days. A control group performed similarly but at ground level (1500 ft). The subjects were evaluated by multiple physiologic studies at altitude and midway between exposures at ground level to look for any residual effects of the hypoxic exposures. No evidence of hematologic acclimatization was found. The changes which were observed were, for the most part, typical of those seen during physical conditioning. The exaggeration of these findings in the altitude group suggest that exposure to hypoxia and physical conditioning evoke similar physiological responses. (Author)

A69-41679 *
EFFECTS OF VARIOUS RESPIRATORY MANEUVERS ON THE PHYSIOLOGICAL RESPONSE TO ANGULAR ACCELERATION.
Jose G. Lipana (NASA, Flight Research Center, Lovelace Foundation Field Laboratory, Edwards, Calif.), John Fletcher (Systems Research Laboratories, Inc., San Antonio, Tex.), William Brown, and George Cohen (Systems Research Laboratories, Inc., San Antonio; USAF, School of Aerospace Medicine, Biodynamics Branch, Brooks AFB, Tex.).
(Aerospace Medical Association, Annual Scientific Meeting, San Francisco, Calif., May 5-8, 1969.)
Aerospace Medicine, vol. 40, Sept. 1969, p. 976-980. 8 refs.
Contract No. AF 41(609)-2897.

Study of the effects of breath holding, M1, Valsalva, and Mueller's maneuvers on healthy males during static condition at various postures and during pure axis rotations. The subject was seated inside a hollow spherical simulator. Rotation was at the rate of 6 rpm with the axis of rotation through the body. Heart rates, ECG, blood pressures, respiratory rates and voice were monitored by telemetry. The characteristics of the response pattern were dependent on the kind of maneuver, the instantaneous posture, and the time the maneuver was initiated. Early obliteration of the pulse pressures were notable with Mueller's and Valsalva maneuvers. On repeated performance, all of the maneuvers studied provoked nausea, vomiting, and syncopal symptoms of varying degrees. The onset of these symptoms limited the duration for which the subject can normally withstand prolonged rotation. Unlike the M1 maneuver, which had beneficial effect during linear positive acceleration, none of these maneuvers was protective against angular acceleration. On the contrary, performance of any of these maneuvers jeopardizes man's tolerance to this spectrum of acceleration. (Author)

A69-41680
IMPAIRMENT OF MENTAL PERFORMANCE AT A SIMULATED ALTITUDE OF 8,000 FEET.
G. R. Kelman and T. J. Crow (Aberdeen, University, Dept. of Physiology, Aberdeen, Scotland).
Aerospace Medicine, vol. 40, Sept. 1969, p. 981, 982.

Eighty medical students performed two types of vigilance task at a simulated altitude of either 2,000 or 8,000 ft. With the easier test (44 subjects), there was no significant difference between performance at 2,000 and at 8,000 ft. With the more difficult test (36 subjects), however, the subjects' initial performance was significantly worse for the hypoxic group as compared with the control group at 2,000 ft. When the subjects had become familiar with the test, the difference between hypoxic and control subjects was not statistically significant. These results support findings of other workers that acute exposure to a simulated altitude of 8,000 ft impairs the learning of a new task. (Author)

A69-41681 #
VARIATIONS OF SPINAL ALIGNMENT IN EGRESS SYSTEMS AND THEIR EFFECT.
George C. Mohr, James W. Brinkley, Leon E. Kazarian, and Walter W. Millard (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, Ohio).
Aerospace Medicine, vol. 40, Sept. 1969, p. 983-988. 6 refs.

Fractures of the vertebral column constitute a serious and undesirably common medical complication of otherwise successful ejections from high performance aircraft. A study was conducted to investigate quantitatively the influence of seat geometry and personal equipment design factors on the intrinsic spinal curvature and vector relationship with the catapult thrust axis. Fourteen male Air Force volunteers were X-rayed while seated with an ejection posture in the F/RF-4C and F-105 ejection seat systems. Quantitative Roentgenometric techniques were used to accurately determine individual vertebral body locations and measure absolute differences governed by seat design features. The sizable differences observed are discussed in terms of biodynamic injury mechanisms. Recommendations for improved seat design are derived. (Author)

A69-41682
COCKPIT NOISE ENVIRONMENT OF AIRLINE AIRCRAFT.
Richard B. Stone (Air Line Pilots Association, Aeromedical Coordinating Committee, Washington, D.C.).
Aerospace Medicine, vol. 40, Sept. 1969, p. 989-993.

Noise level surveys were carried out in the cockpits of the M404, DC6, F27A and J, F227, CV580, CV600, L188, B720, B727, B707, and DC9 aircraft. Octave band analysis during a number of regimes of flight indicates that cruise and high speed descent were the noisiest portions of flight. Comparison of data with damage risk and speech interference criteria demonstrates that many of the currently operated turboprops exceed damage risk criteria. Many of the aircraft, including newer jets, cause communication between pilots to be carried out at a near shout. Noise measurements obtained in the cabins of a number of these aircraft are included. (Author)

A69-41683
PHYSICAL FITNESS AND TOLERANCES TO ENVIRONMENTAL EXTREMES.
K. E. Klein, H. M. Wegmann, H. Brüner, and L. Vogt (Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt, Institut für Flugmedizin, Bad Godesberg, West Germany).
Aerospace Medicine, vol. 40, Sept. 1969, p. 998-1001. 33 refs.

During "submaximum" loading tests of 20-30 min duration at simulated altitude (312 mm Hg), during acceleration, and during exercise at sea level and at moderate simulated altitude (578 mm Hg), heart rates were significantly lower for highly trained athletes (20-25 per cent) than in nonathletes. In maximum tolerance tests, however, there was a significant difference between the two groups only for maximum oxygen uptake at physical exercise, but no indication was seen for a positive cross-adaption effect of physical exercise training on the other stressors. Statistical analysis of the correlation between heart rate responses to the different stressors and the corresponding tolerances proved negligible relationships only; whereas heart rates were always highly dependent on sea level maximum oxygen uptake. The results do not support the idea of an improvement of human tolerance to environmental extremes by physical exercise training. (Author)

A69-41684 #
MEASUREMENT OF MUSCLE FUNCTION IN ASTRONAUTS.
Stanley J. Myers, William P. Sullivan, and Michael McCally (USAF, Aerospace Medical Research Laboratory, Environmental Medicine Div., Wright-Patterson AFB, Ohio).
Aerospace Medicine, vol. 40, Sept. 1969, p. 1002-1005. 20 refs.

Muscle function may be altered following space flight as a result of exposure to conditions of prolonged confinement, inactivity, and weightlessness. Absolute strength, which is often used to evaluate muscle function, has demonstrated rather low test-retest reliability in untrained subjects over long test-retest intervals. This study describes a method which utilizes the time that a fixed percentage of maximum isometric contraction is held to fatigue and demonstrates

that this measure is highly reproducible in untrained subjects over a long time interval. In addition, by utilizing both maximum contraction and endurance, the method enables comparison of parameters of muscle function influenced by both local and cardiovascular factors. The fractional sustained voluntary muscular contraction may also have utility as a provocative test of the circulation. (Author)

A69-41685
RELATION OF KIND OF BACKGROUND FLYING TO TACTICAL PILOTS' ACCIDENT POTENTIAL.
Anchard F. Zeller and Norman Weil (USAF, Directorate of Aerospace Safety, Norton AFB, Calif.).
Aerospace Medicine, vol. 40, Sept. 1969, p. 1006-1008.

It has been hypothesized that pilots flying tactical fighter aircraft have different accident potentials based on the kind of flying experienced prior to assignment in those aircraft. The background flying experience of 183 pilots involved in fighter aircraft accidents was compared to the experience of over 8500 nonaccident pilots flying the same kind of aircraft. The amount of flying time in bomber, cargo, and fighter aircraft as a ratio of each pilot's total flying time was determined for both accident and nonaccident populations. Tests applied to determine whether the backgrounds of the accident and nonaccident groups were similar failed to offer substantial support for the hypothesis that the background materially affects the accident potential of tactical fighter pilots. (Author)

A69-41686
SOME IMPORTANT PROBLEMS OF SPACE PHYSIOLOGY.
V. V. Parin (Institute for Biomedical Problems, Moscow, USSR).
Aerospace Medicine, vol. 40, Sept. 1969, p. 1009-1013.

Discussion of research conducted concerning space physiological problems and of future work planned to provide information regarding remaining questions in space physiology. Experiments in space physiology conducted on board spacecraft and in ground laboratories are described. The work in ground laboratories can be divided into three categories. The first category includes works which are necessary for the preparation and execution of future space-flight experiments. The second category involves the modeling of space-flight factors and the study of their effect on the organism. The third category includes special experiments for the theoretical solution of problems of physiology which have been encountered in actual space flights. G.R.

A69-41687
MEDICAL CERTIFICATION OF CIVIL PILOTS FOLLOWING HEAD TRAUMA.
J. Robert Dille (Federal Aviation Administration, Civil Aeromedical Research Institute, Oklahoma City, Okla.).
Aerospace Medicine, vol. 40, Sept. 1969, p. 1014-1017.

The records of 684,146 active civil airmen were screened to determine the prevalence of a reported history of head trauma and the FAA experience with medical certification of these airmen. Files were also examined for aircraft accidents and for exemptions granted from meeting current medical standards. Of 1383 airmen with reported diagnoses of cerebrovascular accidents, disturbance of consciusness, and convulsive reactions, 55 per cent of the conditions were due to trauma. Despite incomplete data and disagreement on statistical risks of seizures after trauma, dispositions for most of the cases reviewed seemed obvious. Accident investigation data tend to confirm the adequacy of the certification actions. The greatest hazard appears to be unreported history, symptoms, and medication by the airmen, and undetected or unreported pathology by examining physicians. (Author)

A69-41688
PSYCHO-PHYSIOLOGICAL EFFECTS OF FLYING ON AIR HOSTESSES.
R. Graeme Cameron (J. R. Geigy, S.A., Clinical Research Dept., Basel, Switzerland).
Aerospace Medicine, vol. 40, Sept. 1969, p. 1018-1020.

Fifteen psychophysiological functions were investigated by questionnaire in 98 air hostesses, a follow-up investigation on 50 of them being carried out six years later. Details were obtained concerning the situation before flying, while flying in propeller aircraft, while flying in jet aircraft, and after ceasing flight-duty. Deterioration in physiological functions during flight-duty is seen to be a predictable result of the working environment and improves after ceasing flying. The psychic factors which deteriorated continued to deteriorate after ceasing flying, the deterioration being therefore less likely to be a result of flying as such. (Author)

A69-41689
EFFECT OF FLYING ON THE MENSTRUAL FUNCTION OF AIR HOSTESSES.
R. Graeme Cameron (J. R. Geigy, S.A., Clinical Research Dept., Basel, Switzerland).
Aerospace Medicine, vol. 40, Sept. 1969, p. 1020-1023.

Duration of menstruation, length of cycle, regularity, dysmenorrhoea, and severity of menstrual flow were investigated by questionnaire in 98 air hostesses, the investigation being repeated six years later in 50 of the original group. Details were obtained of the situation before flying, while flying in propeller aircraft, in the first year of jet flying, after six years of jet flying, and after ceasing flight duty. Although there was found to be a general worsening of these menstrual functions initially in about one quarter of hostesses, there was a reversal approximating the preflight situation with increasing jet experience. In addition, the number of pregnancies and number of miscarriages were obtained from the married ex-hostesses, and no evidence was found for either infertility or increased liability to miscarriage. It is concluded that jet flying causes no long-term adverse effects on these gynaecological functions of air hostesses. (Author)

A69-41690
PSYCHOTHERAPEUTIC TREATMENT OF DEPRESSIONS AND NEUROSES IN AVIATION MEDICINE.
C. J. Blanc, E. LaFontaine, R. Lelion, and S. Geier (Compagnie Nationale Air France, Paris, France).
Aerospace Medicine, vol. 40, Sept. 1969, p. 1024-1026. 18 refs.

Survey of experience with subjects belonging to flight crews who were given psychotherapy treatment during the last six years (75 stewardesses, 18 stewards, 8 pilots, and 7 flight engineers). These subjects gave evidence of depressive episodes or acute neurotic reactions related to various conflictive factors. The indications of the different psychotherapy techniques are discussed. The psychotherapy may or may not be associated with supporting pharmacology. The "face to face" treatments, at an average frequency of one session per week, proved to be the most effective with flight crew members. They allow a reduction in anxiety by cathartic effect. They neutralize unconscious self punishment behavior linked to psychoaffective regression. Their aim is to restore the former balance of the personality. With cockpit crews, recourse to psychotherapy makes it possible, in a large number of cases, to avoid prescribing thymoanaleptic medicines which always entail long periods of incapacity for flight. (Author)

A69-41766
BIOTELEMETRY OF EKG SIGNALS WITHIN A SMALL, CLOSED CHAMBER.
F. C. Carpenter, Jr. (McDonnell Douglas Corp., McDonnell Douglas Astronautics Co., Western Div., Huntington Beach, Calif.).
IN: INTERNATIONAL FOUNDATION FOR TELEMETERING, INTERNATIONAL TELEMETERING CONFERENCE, WASHINGTON, D.C., SEPTEMBER 15-17, 1969, PROCEEDINGS. (A69-41734 23-07)
Woodland Hills, Calif., International Foundation for Telemetering (ITC Proceedings. Volume 5), 1969, p. 416-425. 7 refs.

Development of a system for reliably telemetering biomedical

EKG data from personnel within a closed metallic chamber to a receiver also located within the chamber. Analysis of the environment showed that mathematical prediction of the propagation characteristics of the chamber would be difficult, if not impossible, due to its odd interior configuration. An empirical approach was taken. Several systems approaches were considered; an FM/AM system and an FM/FM system were built, and each was evaluated in the actual environment. Data are presented on test results. A successful system is discussed, including a description of the receiving antenna network employed to ensure reception of the transmitted signals regardless of the location of personnel within the chamber. Conclusions regarding the chamber characteristics are given. O.H.

A69-41783
AVIATION AND SPACE MEDICINE; PROCEEDINGS OF THE SEVENTEENTH INTERNATIONAL CONGRESS, OSLO, NORWAY, AUGUST 5-8, 1968.
Edited by Birger Hannisdahl and C. W. Sem-Jacobsen.
Oslo, Universitetsforlaget, 1969. 398 p. In English and French. $33.40.

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CHANGES IN THE CATECHOLAMINE CONTENT AND CYTOCHEMICAL CHARACTERISTICS IN THE HYPOTHALAMUS OF CATS EXPOSED TO SIMULATED ALTITUDE. R. Debijadji, L. Perovic, V. Varagic, and N. Stošić (Institute of Aviation Medicine, Zemun, Yugoslavia), p. 253, 254.

ADVANTAGE OF NONSURGICAL METHODS OF MEASURING CARDIAC OUTPUT IN AEROSPACE MEDICINE (INTERET DES METHODES NON SANGLANTES DE MESURE DU DEBIT CARDIAQUE EN MEDECINE AERONAUTIQUE ET SPATIALE). J. Pernod, J. Demange, R. Carré, P. Hardel, and J. Kermarec (Hôpital Militaire Percy, Clamart, Hauts-de-Seine, France), p. 255-259. 9 refs. (See A69-41813 23-04)

THE SYNTHESIS OF HEMOPROTEIDS IN THE LIGHT OF BIOCHEMICAL EVOLUTION. G. Schäfer (Deutsche Versuchsanstalt für Luft- und Raumfahrt, Bad Godesberg, West Germany), p. 260-262. (See A69-41814 23-04)

EFFECTS OF PHYSICAL AND PSYCHIC STRESS ON PHOSPHATIDYL GLYCEROL AND RELATED PHOSPHOLIPIDS IN HUMANS AND ANIMALS. B. D. Polis, H. P. Schwarz, E. Polis, and L. Dreisbach (U.S. Naval Material Command, Johnsville, Pa.), p. 263-270. 8 refs. (See A69-41815 23-04)

RUSSIAN AEROSPACE MEDICINE (ABSTRACTS ONLY).

LESION IN BRAIN BLOOD CIRCULATION WITH EFFECT OF ACCELERATION. Yn. E. Moskalenko, G. B. Vainshtein, and E. Panchenkova, p. 273.

EVALUATION OF MAN'S ADAPTIVE CAPABILITIES BY MEANS OF SOME FUNCTIONAL TESTS. T. N. Krupina, G. P. Mikhailovskii, T. V. Benevolenskaia, Ia. Tyzul, and O. I. Boikova, p. 274.

THE EFFECT OF A DIET CONTAINING SINGLE-CELLED ALGA PROTEINS ON THE COMPOSITION OF INTESTINAL MICROFLORA. V. M. Shilov, N. N. Lizkó, V. I. Fofanov, and N. S. Kliushkina, p. 275.

ON THE PROBLEM OF FOOD REGENERATION IN LIFE-SUPPORT SYSTEMS. Iu. Nefiodov, A. Ustiakov, and V. Vysotskii, p. 276.

PECULIARITIES OF HUMAN HEAT EXCHANGE UNDER HIGH ALTITUDE CONDITIONS. I. N. Chern'kov, p. 277.

ON INCREASING HUMAN NON-SPECIFIC TOLERANCE TO ENVIRONMENTAL EXTREMES. G. V. Ananev, V. P. Baranova, N. N. Gurovskii, M. M. Korotaev, T. N. Krupina, B. T. Romanov, and I. Ia. Iakovleva, p. 278.

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EARLY BRAIN ATROPHIES. V. O. Savić, N. Dekleva, and I. Milosavljević, p. 281-285. 23 refs. (See A69-41816 23-04)

DISTURBANCES OF THE BALANCE SYSTEM IN MAN DURING ALCOHOLIC HANGOVER. M. Bergstedt (Sahlgren's Hospital, Göteborg, Sweden), p. 286-294. 11 refs. (See A69-41817 23-04)

OUT-OF-TIME OPERATIONS IN CAVES (OPERATIONS HORS DU TEMPS EN CAVERNE). M. Siffre (Institut Français de Spéléologie, Nice, France), p. 295-299. (See A69-41818 23-05)

TIME PERCEPTION IN SENSORY DEPRIVATION—THE ROLE OF SOCIAL ISOLATION. L. Sváb and J. Gross (Psychiatric Research Institute, Prague, Czechoslovakia), p. 300.

CIRCADIAN RHYTHM OF ORTHOSTATIC TOLERANCE AND ITS INFLUENCE ON POST-SPACEFLIGHT ORTHOSTATIC HYPOTENSION J. C. Aschoff (Bundesministerium der Verteidigung, Luftwaffe, Fürstenfeldbruck, West Germany), p. 301.

JUMBO JET AND SST.

JUMBO JET. K. Hagrup (Scandinavian Airlines Systems, Inc., Stockholm, Sweden), p. 305-307. (See A69-41819 23-02)

HUMAN ENGINEERING OF SST—MAN'S ROLE IN ADVANCED AIRCRAFT OPERATIONS. S. J. Gerathewohl (Federal Aviation Administration, Washington, D.C.) and J. Gannett (Federal Aviation Administration, Washington, D.C.; Boeing Co., Seattle, Wash.), p. 308-319. 16 refs. (See A69-41820 23-05)

ACCELERATION.

THE INFLUENCE OF STATURE AND PHYSICAL FITNESS ON TILT-TABLE AND ACCELERATION TOLERANCE. K. E. Klein, H. Brüner, D. Jovy, L. Vogt, and H. M. Wegmann (Deutsche Versuchsanstalt für Luft- und Raumfahrt, Bad Godesberg, West Germany), p. 323-329. 25 refs. (See A69-41821 23-05)

BLOOD PRESSURE RESPONSE TO POSITIVE ACCELERATION IN FLIGHT AND ON THE CENTRIFUGE. L. Pircher (Swiss Air Force, Dübendorf, Switzerland), p. 330-332. (See A69-41822 23-04)

THE EFFECT OF POSITIVE ACCELERATION UPON CARDIAC OUTPUT AND REGIONAL BLOOD FLOW IN THE DOG. D. H. Glaister (Royal Air Force, Farnborough, Hants., England), p. 333-338. (See A69-41823 23-04)

A TECHNIQUE PERMITTING EVALUATION OF CARDIOVASCULAR CHANGES INDUCED BY LONG-TERM WEIGHTLESSNESS. V. P. Popovic and P. Popovic (Emory University, Atlanta, Ga.), p. 339-343. 18 refs. (See A69-41824 23-05)

PULMONARY FUNCTION DURING ZERO-GRAVITY MANEUVERS. J. F. Tomashefski (Ohio State University, Columbus, Ohio) and M. F. Foley, p. 344-347. 7 refs. (See A69-41825 23-04)

CLINICAL AEROSPACE MEDICINE. III.

DRY CABIN ENVIRONMENT, DEHYDRATION, AND RENAL CALCULUS IN AIRCREW. P. R. Richards (Air Corporations Joint Medical Service, Hounslow, Middx., England), p. 351-356. 13 refs. (See A69-41826 23-05)

PHYSIOLOGICAL AND PSYCHOTECHNICAL CRITERIA FOR THE ARRANGEMENT OF DIALS AND CLOCKS IN THE PILOT'S COCKPIT. W. Dybowski (USAF, Medical Laboratory Center, London, England), p. 357-361. (See A69-41827 23-05)

HUMAN FACTORS IN AIR TRAFFIC CONTROL. G. Castle (Board of Trade, London, England), p. 362-366. (See A69-41828 23-05)

FLIGHT-DECK VISION AND THE AGING EYE. C. R. Harper

and G. J. Kidera (United Air Lines, Inc., Elk Grove Township, Ill.), p. 367-372. (See A69-41829 23-04)

RADIATION AND SPACE ENVIRONMENTS.

PROVISION OF SOLAR FLARE RADIATION INFORMATION IN SUPPORT OF SUPERSONIC TRANSPORT OPERATIONS—A REVIEW OF DEVELOPMENTS. L. E. Buley (International Civil Aviation Organization, Montreal, Canada), p. 375-381. (See A69-41830 23-02)

NECESSITY OF USING THE DIRECT CORRELATIONS BETWEEN THE DAMAGES CAUSED AND THE TRAJECTORIES IN THE STUDY OF THE BIOLOGICAL EFFECTS OF HEAVY IONS IN COSMIC RADIATION (NECESSITE D'UTILISER LES CORRELATIONS DIRECTES ENTRE LES DOMMAGES CAUSES ET LES TRAJECTOIRES DANS L'ETUDE DES EFFETS BIOLOGIQUES DES IONS LOURDS DU RAYONNEMENT COSMIQUE). G. Deltour, A. Pfister (Centre d'Enseignement et de Recherches de Médecine Aéronautique, Paris, France), R. Kaiser (Strasbourg, Centre de Recherches, Strasbourg, France), and L. Miro, p. 382-385. 21 refs. (See A69-41831 23-04)

RESISTANCE TO INFECTION IN SPACE-CABIN ENVIRONMENT. R. Ehrlich and B. J. Mieszkuc (IIT Research Institute, Chicago, Ill.), p. 386-392. 12 refs. (See A69-41832 23-05)

RELEVANCE OF A SPACE-RESEARCH CENTRIFUGE TO FUTURE SPACE-FLIGHT PROGRAMS. B. D. Newsom (General Dynamics Corp., San Diego, Calif.), p. 393-399. (See A69-41833 23-05)

A69-41784

THE IMPROVEMENT IN THE APPRAISAL OF THE ELECTRICAL ACTIVITY OF THE HEART BY MODERN COMPUTATION METHODS.

P. Rijlant (Institut Solvay de Physiologie, Brussels, Belgium).

IN: AVIATION AND SPACE MEDICINE; PROCEEDINGS OF THE SEVENTEENTH INTERNATIONAL CONGRESS, OSLO, NORWAY, AUGUST 5-8, 1968. (A69-41783 23-05)

Edited by Birger Hannisdahl and C. W. Sem-Jacobsen.

Oslo, Universitetsforlaget, 1969, p. 15-23.

Survey showing how modern computation can be brought to bear on electrocardiography. It is shown that computer-assisted methods have drastically changed the outlook on medical research, by making it possible to grasp the whole extent of a given problem. With the aid of the computer, a clinician can proceed along many parallel or converging lines simultaneously and build up an understanding of a system no human by his own means could have mastered. The final conclusions drawn from computer-assisted analyses are the verbal translation of factual evidence provided by the new physical aids. V.P.

A69-41785

MEANS OF AERIAL EVACUATION AT THE DISPOSAL OF A PARIS HOSPITAL (LES MOYENS D'EVACUATIONS AERIENS A LA DISPOSITION D'UN SERVICE HOSPITALIER PARISIEN).

M. Poisvert, M. Cara, J. P. Hurtaud, C. Caille, S. Ivanoff, and R. Galinski (Groupe Hospitalier Necker-Enfants Malades-Vaugirard, Département d'Anesthésiologie, Paris, France).

IN: AVIATION AND SPACE MEDICINE; PROCEEDINGS OF THE SEVENTEENTH INTERNATIONAL CONGRESS, OSLO, NORWAY, AUGUST 5-8, 1968. (A69-41783 23-05)

Edited by Birger Hannisdahl and C. W. Sem-Jacobsen.

Oslo, Universitetsforlaget, 1969, p. 30-36. In French.

Survey of the currently available means of transporting patients, or people involved in accidents, from one hospital to another that possesses specialists and specialized equipment for a given case. Long-term efforts have now resulted in an evacuation system that includes short- and long-haul aircraft, small turbojets, and helicopters belonging to such organizations as the Air Force, National Guard, and commercial airlines. The question of when, how, and where such transportation should be used is decided on and strictly controlled by a special board of experts. V.P.

A69-41786

A REVIEW OF FIVE YEARS OF PRIVATE PRACTICE AT SYDNEY AIRPORT.

P. Crowley (New South Wales, University, Sydney, Australia).

IN: AVIATION AND SPACE MEDICINE; PROCEEDINGS OF THE SEVENTEENTH INTERNATIONAL CONGRESS, OSLO, NORWAY, AUGUST 5-8, 1968. (A69-41783 23-05)

Edited by Birger Hannisdahl and C. W. Sem-Jacobsen.

Oslo, Universitetsforlaget, 1969, p. 37-39.

Brief review of the history, operating conditions, medical record, and statistics of a private, one-doctor, one-nurse clinic that was started at the Sydney airport six and a half years ago. (The Sydney airport is both the domestic and international airport for a city of two and a half million people.) The clinic was attended by 21,126 people during the first five years of its existence and by 4668 people during the last year. V.P.

A69-41787

ALTITUDE ACCLIMATION AND MUSCULAR WORK PERFORMED (ACCLIMATEMENT A L'ALTITUDE ET TRAVAIL MUSCULAIRE SOUTENU).

M.-V. Strumza (Paris, Université, Faculté de Médecine, Paris, France).

IN: AVIATION AND SPACE MEDICINE; PROCEEDINGS OF THE SEVENTEENTH INTERNATIONAL CONGRESS, OSLO, NORWAY, AUGUST 5-8, 1968. (A69-41783 23-05)

Edited by Birger Hannisdahl and C. W. Sem-Jacobsen.

Oslo, Universitetsforlaget, 1969, p. 43-47. In French.

Research supported by the Direction des Recherches et Moyens d'Essais.

Discussion of experiments in which rats were made to run up to a point of total exhaustion at 30 m/min up a 5 per cent incline. By gradually reducing the pressure over a period of two months, it proved possible to achieve a degree of "altitude acclimation" that manifested itself in an extension of the initial 182 plus or minus 15 sec to total exhaustion to 223 plus or minus 10 sec. Discontinuation of the physical exercise resulted in a loss of adaptation. V.P.

A69-41788

HYPOXIA RESISTANCE TEST AT 7,500 M (24,600 FT) IN THE LOW-PRESSURE CHAMBER BEFORE AND AFTER COMBINED ERGOMETER AND ALTITUDE TRAINING.

H. Renemann, A. Low, H. Weidemann, L. Samek, and H. Roskamm (Freiburg, Universität, Medizinische Universitätsklinik, Freiburg im Breisgau, West Germany).

IN: AVIATION AND SPACE MEDICINE; PROCEEDINGS OF THE SEVENTEENTH INTERNATIONAL CONGRESS, OSLO, NORWAY, AUGUST 5-8, 1968. (A69-41783 23-05)

Edited by Birger Hannisdahl and C. W. Sem-Jacobsen.

Oslo, Universitetsforlaget, 1969, p. 48-52. 7 refs.

Research supported by the Kuratorium für die Sportmedizinische Forschung.

Discussion of experiments in which the arterial oxygen partial pressures and heartbeat rates were continuously measured for three groups of young healthy human test subjects during acute hypoxia at a low-pressure-chamber altitude of 24,600 ft before and after four weeks of daily ergometer training. The daily half-hour ergometer training was performed at "altitudes" of 11,650, 7350, and 800 ft, respectively, for each group. Sensomotor tests showed no significant improvement in the sensomotor performance of any of the groups; however, in the group subjected to training at the highest altitude, the arterial oxygen partial pressure decreased more slowly, and the increase in the heartbeat rate during hypoxia was smaller than in the other groups. V.P.

A69-41790 #

ENDOCRINE FUNCTIONS IN AN OXYGEN ATMOSPHERE AT REDUCED TOTAL PRESSURE.

F. Ulvedal and Ann J. Roberts (USAF, School of Aerospace Medicine, Aerospace Medical Div., Brooks AFB, Tex.).
IN: AVIATION AND SPACE MEDICINE; PROCEEDINGS OF THE SEVENTEENTH INTERNATIONAL CONGRESS, OSLO, NORWAY, AUGUST 5-8, 1968. (A69-41783 23-05)
Edited by Birger Hannisdahl and C. W. Sem-Jacobsen.
Oslo, Universitetsforlaget, 1969, p. 56-67. 29 refs.

Study of the various aspects of the pituitary-adrenocortical axis and neuroendocrine functions of rats maintained in an oxygen atmosphere at a total pressure of 380 mm Hg. It was found that norepinephrine excretion was depressed in animals exposed to the oxygen atmosphere for 49 days. Epinephrine values indicated an initial period of depressed excretion followed by a period of increased excretion. Urinary corticosterone excretion showed an increased adrenal response to the environmental conditions, as did the adrenal weights. Further evidence for pituitary-adrenal involvement is demonstrated by a biphasic response of adrenal ascorbic acid concentrations and by electromicrographs of the anterior pituitary and adrenal glands. V.P.

A69-41791
EFFECTS OF INCREASED OXYGEN PRESSURE ON ADRENAL STEROID AND CATECHOLAMINE RELEASE.
R. T. Houlihan, J. Zavodni, and M. Cross (Pennsylvania State University, Dept. of Biology, University Park, Pa.).
IN: AVIATION AND SPACE MEDICINE; PROCEEDINGS OF THE SEVENTEENTH INTERNATIONAL CONGRESS, OSLO, NORWAY, AUGUST 5-8, 1968. (A69-41783 23-05)
Edited by Birger Hannisdahl and C. W. Sem-Jacobsen.
Oslo, Universitetsforlaget, 1969, p. 68-73. 14 refs.
Contract No. NR-102-654.

Study of the effects of increased oxygen tension on adrenocortical and sympatho-adreno-medullary activity in adult male rats. It was found that the test animals appear to adapt to oxygen tensions of as high as 460 mm Hg oxygen partial pressure, as indicated by regulation of hormone production. At high oxygen tension (above 1500 mm Hg) there is an increase in epinephrine in serum, urine, and possibly adrenal gland, but little change in norepinephrine. Rats in oxygen at 700 mm Hg oxygen partial pressure for three days exhibit a gradual decline in hypothalamic and urinary norepinephrine reaching the lowest level just prior to death. There is a slight increase in adrenal norepinephrine but little change in serum concentration. It is proposed that this results in epinephrine being converted to indoles which are highly toxic and inhibit cell function. (Author)

A69-41792
MEDICAL FACTORS IN U.S. GENERAL AVIATION ACCIDENTS.
P. V. Siegel and S. R. Mohler (Federal Aviation Administration, Washington, D.C.).
IN: AVIATION AND SPACE MEDICINE; PROCEEDINGS OF THE SEVENTEENTH INTERNATIONAL CONGRESS, OSLO, NORWAY, AUGUST 5-8, 1968. (A69-41783 23-05)
Edited by Birger Hannisdahl and C. W. Sem-Jacobsen.
Oslo, Universitetsforlaget, 1969, p. 77-83.

Review of currently avialable data obtained from a continuing program that was initiated to investigate each general aviation accident and to clarify the medical factors contributing to accidents. Some relatively recent accidents are described which illustrate the role of such medical factors as sudden incapacitations (as revealed by coronary artery studies at autopsy), hypoxia, carbon monoxide, ethyl alcohol, and psychological factors. Proposed remedies include presentation of educational material (films), certain proposed regulations for preventing specific types of accident (new oxygen requirements), and proposed regulation for improving crashworthiness of general aviation aircraft. V.P.

A69-41794
THE EFFECTS OF ALTITUDE ON PILOT PERFORMANCE.
R. A. McFarland (Harvard University, Harvard School of Public Health, Daniel and Florence Guggenheim Center for Aerospace Health and Safety, Boston, Mass.).
IN: AVIATION AND SPACE MEDICINE; PROCEEDINGS OF THE SEVENTEENTH INTERNATIONAL CONGRESS, OSLO, NORWAY, AUGUST 5-8, 1968. (A69-41783 23-05)
Edited by Birger Hannisdahl and C. W. Sem-Jacobsen.
Oslo, Universitetsforlaget, 1969, p. 96-108. 34 refs.

Review of the experimental results obtained by the author and others in regard to the initial (or threshold) effects of altitude. A comparison is made of the effects on various sensory and mental functions, using the older as well as the more recent experimental techniques of studying particular functions singly and in combination. The analysis is also concerned with the effects of more advanced conditions of hypoxia, as well as cases where various types of failure may be expected to occur at increasingly higher altitudes. An attempt is made to apply the results of laboratory studies to the influence of altitude on pilot performance in flight. The analysis includes some reference to the way in which drugs, carbon monoxide, alcohol, physical fitness, selected medical conditions, and age may accentuate the effects of hypoxia alone. The final analysis is concerned with the true "physiological" altitude of the pilot, as compared with the effects of variations in pressure altitude alone in the performance of routine and emergency conditions. A particular effort is made to relate the experimental findings from laboratory studies to the present operational procedures and practices of flight in regard to oxygen use and to flight safety. (Author)

A69-41795
HYPERTENSION AND AVIATION MEDICINE.
H. W. Kirchhoff and I. Smith (Bundesministerium der Verteidigung, Luftwaffe, Flugmedizinisches Institut, Fürstenfeldbruck, West Germany).
IN: AVIATION AND SPACE MEDICINE; PROCEEDINGS OF THE SEVENTEENTH INTERNATIONAL CONGRESS, OSLO, NORWAY, AUGUST 5-8, 1968. (A69-41783 23-05)
Edited by Birger Hannisdahl and C. W. Sem-Jacobsen.
Oslo, Universitetsforlaget, 1969, p. 111-114.

Discussion of tests carried out under stress on a bicycle ergometer at 100-W load to clarify the observed increase in the blood pressure exhibited by a relatively large percentage of German Air Force pilots during examinations at rest. The results revealed an alarmingly high percentage (up to 23 per cent) of transient hypertension. A physical fitness program was, therefore, worked out for the pilots, in addition to the four-week open-air courses. The excellent results obtained with this program indicate that open-air treatments have a beneficial effect on pilots. V.P.

A69-41796
STUDIES OF THE NUTRITIONAL COMPONENT OF FATIGUE IN GLIDER PILOTS (RECHERCHES SUR LA COMPOSANTE NUTRITIONNELLE DE LA FATIGUE CHEZ LES PILOTES DE VOL A VOILE).
M. Boulangé, J. Menou, J. P. Crance, and J. Comoy (Nancy, Université, Laboratoire de Physiologie, Nancy, France).
IN: AVIATION AND SPACE MEDICINE; PROCEEDINGS OF THE SEVENTEENTH INTERNATIONAL CONGRESS, OSLO, NORWAY, AUGUST 5-8, 1968. (A69-41783 23-05)
Edited by Birger Hannisdahl and C. W. Sem-Jacobsen.
Oslo, Universitetsforlaget, 1969, p. 120-125. 10 refs. In French.

Study of the nutritional habits of glider pilots in an attempt to isolate the causes of the so-called glider fatigue phenomenon. In addition to endocrine modifications and some changes in cardiovascular functions, a nutritional deficiency was discovered in these pilots. Glycemia cycles and very careful measurements of dietary intakes demonstrated an inadequate matutinal caloric intake (particularly low in protides). Frequent skipping of lunch and difficulties encountered with in-flight eating provoke noon and afternoon hypoglycemias. An increased safety factor results when the diets are corrected. T.M.

A69-41797
DYNAMIC ROENTGENOLOGY OF THE CERVICAL SPINE—GENERAL INTEREST OF THE METHOD IN AERONAUTICAL MEDICINE (LA RADIOGRAPHIE DYNAMIQUE DU RACHIS CERVICAL—INTERET GENERAL DE LA METHODE EN MEDECINE AERONAUTIQUE).
R. P. Delahaye and G. Gueffier (Service de Médecine Aéronautique, Hôpital d'Instruction des Armées, Versailles, France).
IN: AVIATION AND SPACE MEDICINE; PROCEEDINGS OF THE SEVENTEENTH INTERNATIONAL CONGRESS, OSLO, NORWAY, AUGUST 5-8, 1968. (A69-41783 23-05)
Edited by Birger Hannisdahl and C. W. Sem-Jacobsen.
Oslo, Universitetsforlaget, 1969, p. 126-132. 19 refs. In French.

Description of a new method of dynamic roentgenology of the cervical spine, especially indicated in aeronautical traumatology. The method is easily effected in neutral profile, hyperflection, and hyperextension. Dynamic roentgenology is especially interesting in cervical dislocations; it displays the loss of parallelism in the articular processes or, on the level of the atlas-axis, the widening of the anterior space between atlas and axis. In sprains and minor traumas of the cervical spine, a nonphysiological rectitude or a nonharmonious curvature can be observed. P.G.

A69-41798
RESULTS OF A DYNAMIC X-RAY STUDY OF THE CERVICAL SPINE IN MILITARY PILOTS OF JET AIRCRAFT (RESULTATS DE L'EXPLORATION RADIODYNAMIQUE DU RACHIS CERVICAL DES PILOTES MILITAIRES D'AVIONS A REACTION).
R. P. Delahaye and G. Gueffier (Service de Médecine Aéronautique, Hôpital d'Instruction des Armées, Versailles, France).
IN: AVIATION AND SPACE MEDICINE; PROCEEDINGS OF THE SEVENTEENTH INTERNATIONAL CONGRESS, OSLO, NORWAY, AUGUST 5-8, 1968. (A69-41783 23-05)
Edited by Birger Hannisdahl and C. W. Sem-Jacobsen.
Oslo, Universitetsforlaget, 1969, p. 133-139. 16 refs. In French.

Results of an X-ray study of the dynamics of the cervical spine in military pilots of jet aircraft as compared to nonflying personnel, persons with spinal injuries, and pilots of other types of aircraft. The statistical study demonstrated that the anomalies in the curvature of the cervical spine are more significant for crew members than for nonflying personnel. This finding particularly affects the pilots of jet aircraft. All classes of flying personnel exhibited very high percentages of nonharmonious curvatures and disk pinchings. Flight personnel also exhibited a significantly increased percentage of cervical spondylosis due to arthrosis of the uncus. T.M.

A69-41799
***AEROSPACE MEDICAL PROGRAMS IN MEDICAL FACULTIES* IN THE USA.**
R. L. Meiling (Ohio State University, College of Medicine, Columbus, Ohio).
IN: AVIATION AND SPACE MEDICINE; PROCEEDINGS OF THE SEVENTEENTH INTERNATIONAL CONGRESS, OSLO, NORWAY, AUGUST 5-8, 1968. (A69-41783 23-05)
Edited by Birger Hannisdahl and C. W. Sem-Jacobsen.
Oslo, Universitetsforlaget, 1969, p. 140-145.

Description of the aerospace medical educational programs at medical faculties in the U.S. and especially at Ohio State University. The educational program for candidates for the degree of Doctor of Medicine is discussed, as well as the post-MD (residency) training program, and the continuing medical education program for practicing physicians. Z.W.

A69-41800 *
PRESCRIPTION OF EXERCISE FOR THE HYPOKINETIC AIRLINE PILOT.
L. E. Morehouse (NASA, Manned Spacecraft Center, Dept. of Preventive Medicine, Houston, Tex.; California, University, Dept. of Physical Education, Human Performance Laboratory, Los Angeles, Calif.), W. L. Marxer, and E. D. Warren (NASA, Manned Spacecraft Center, Dept. of Preventive Medicine, Houston, Tex.; Federal Aviation Administration, Los Angeles, Calif.).
IN: AVIATION AND SPACE MEDICINE; PROCEEDINGS OF THE SEVENTEENTH INTERNATIONAL CONGRESS, OSLO, NORWAY, AUGUST 5-8, 1968. (A69-41783 23-05)
Edited by Birger Hannisdahl and C. W. Sem-Jacobsen.
Oslo, Universitetsforlaget, 1969, p. 146-153.

Discussion of the recent advances in exercise physiology and instrumentation which have made it possible to establish standards for evaluation of exercise tolerance, to define personal training loads, and to prescribe exercise for the hypokinetic airline pilots in accordance with their needs and interests. The signs of hypokinesis in airline pilots, due mostly to lack of physical exercise, the prescriptions of physical exercise in accurate doses, the pertinent predictive tests and their evaluation, are described. A number of methods and means of controlling the heart rate are reviewed. The procedures used in calibration tests to establish the current level of the pilot's most vigorous regular physical activity and the maximum work rate at which exercise is well tolerated, as well as the respective metered training regimens, are commented on in detail. O.H.

A69-41802
AN 8-CHANNEL TELEMETER SYSTEM FOR E.E.G.
E. Kaiser (Kaisers Laboratorium A/S, Copenhagen, Denmark).
IN: AVIATION AND SPACE MEDICINE; PROCEEDINGS OF THE SEVENTEENTH INTERNATIONAL CONGRESS, OSLO, NORWAY, AUGUST 5-8, 1968. (A69-41783 23-05)
Edited by Birger Hannisdahl and C. W. Sem-Jacobsen.
Oslo, Universitetsforlaget, 1969, p. 164-167.

Description of a multichannel FM/FM EEG telemeter-system with eight channels of equal bandwidths. The subcarrier oscillators operate on the basis of field-effect transistors in an RC active filter loop. Hf modulation and frequency multiplication are obtained via varactor diodes. Subcarrier signals within the audio range make possible signal storage on a high-quality entertainment-type tape recorder. (Author)

A69-41803 *
A STATUS REPORT ON SPACE MEDICINE IN THE USA.
C. A. Berry (NASA, Manned Spacecraft Center, Houston, Tex.).
(*Aerospace Medicine*, vol. 40, July 1969, p. 762-769.)
IN: AVIATION AND SPACE MEDICINE; PROCEEDINGS OF THE SEVENTEENTH INTERNATIONAL CONGRESS, OSLO, NORWAY, AUGUST 5-8, 1968. (A69-41783 23-05)
Edited by Birger Hannisdahl and C. W. Sem-Jacobsen.
Oslo, Universitetsforlaget, 1969, p. 168-180. 8 refs.
(For abstract see issue 19, page 3456, Accession no. A69-36460)

A69-41804
STRESS-INDUCED TRANSITORY OCULOMOTOR IMBALANCE AND ITS SIGNIFICANCE IN AEROSPACE FLIGHT.
L. M. Fenning.
IN: AVIATION AND SPACE MEDICINE; PROCEEDINGS OF THE SEVENTEENTH INTERNATIONAL CONGRESS, OSLO, NORWAY, AUGUST 5-8, 1968. (A69-41783 23-05)
Edited by Birger Hannisdahl and C. W. Sem-Jacobsen.
Oslo, Universitetsforlaget, 1969, p. 183-200. 163 refs.

Determination of the effect of flight-induced stresses on an apparently normal pilot's oculomotor equilibrium. Oculobulbar inertial displacements with transitory changes in visual perspective are induced by cephalopercussion. Decompression with and without oxygen administration, ergometry, and Valsava (M-1) maneuvers demonstrate a wide range of transitory changes in oculomotor balance, as well as the expected changes in blood pressure with variable persistencies. The deviations from habitual control values

vary from individual to individual. Changes in oculomotor equilibrium result in angular vergence deviations, changing retinal image disparity, and therefore egocentrifugal optical projection under binocular fusion causing misjudgment of actual distances. Accompanying cyclotorsions about the visual axes induce changes in space perspective, and parallel versional changes cause contradirectional deviation in optical projection. Changes in phoria and fusional reserve relationships account for strain, fatigue, and near-vision problems. Double vision occurs when fusional reserves become inadequate. Cardiovascular reaction and changes in oculomotor equilibrium demonstrate an apparent relationship. A system analysis of the physiological mechanisms and events is presented to explain the interrelated phenomena. Z.W.

A69-41805
GLAUCOMA IN COMMERCIAL PILOTS.
G. F. Catlett and G. J. Kidera (United Air Lines, Inc., Medical Dept., Chicago, Ill.).
IN: AVIATION AND SPACE MEDICINE; PROCEEDINGS OF THE SEVENTEENTH INTERNATIONAL CONGRESS, OSLO, NORWAY, AUGUST 5-8, 1968. (A69-41783 23-05)
Edited by Birger Hannisdahl and C. W. Sem-Jacobsen.
Oslo, Universitetsforlaget, 1969, p. 201-215. 25 refs.

Use of indentation tonometry medical evaluations of flight personnel. More than 14,000 individual examinations were carried out on 2046 pilots between 40 and 60 years of age. Forty-nine cases of confirmed ocular hypertension were detected for a cumulative 10-year incidence of 2.4 per cent. Among these cases, nine were eventually diagnosed as chronic simple glaucoma, representing only 0.44 per cent of those studied. Drug therapy, where indicated, was well tolerated with effective pressure control, and visual field losses were minimal in extent and well contained. There were no cases in which grounding was required. The results confirm the value and safety of routine tonometry in aviation medicine, but indicate that the prevalence of occult pathology which can be demonstrated thereby has been exaggerated in the commercial pilot population. (Author)

A69-41806
THE DANGER OF CONTACT LENSES AT ALTITUDE.
W. A. Newsom, T. J. Tredici, and L. E. Noble (Iowa, University, University Hospitals, Dept. of Ophthalmology, Iowa City, Iowa).
IN: AVIATION AND SPACE MEDICINE; PROCEEDINGS OF THE SEVENTEENTH INTERNATIONAL CONGRESS, OSLO, NORWAY, AUGUST 5-8, 1968. (A69-41783 23-05)
Edited by Birger Hannisdahl and C. W. Sem-Jacobsen.
Oslo, Universitetsforlaget, 1969, p. 216-218.

Assessment of the degree of danger in wearing contact lenses while piloting an aircraft at high altitude. In order to establish the incidence of the development of bubbles beneath corneal contact lenses at altitude, a random sample of volunteer subjects was exposed to reduced atmospheric pressures in the hypobaric chambers at the USAF School of Aerospace Medicine. Each volunteer was a "satisfied" corneal contact lens wearer and each had been previously fitted by a different contact lens specialist. None had been fitted by the authors. The subjects were exposed to reduced atmospheric pressure at a simulated altitude of 40,000 ft at a rate of 5000 ft per minute. They were then examined by a physician in the chamber to determine the presence or absence of bubbles beneath the lenses. Bubbles were observed beneath 21 of 32 contact lenses for an incidence of 66 per cent. The visual effects were variable and were related to the size and number of bubbles observed. (Author)

A69-41807
NIGHT VISION REQUIREMENTS FOR COMBAT PILOTS IN SOUTH VIETNAM.
Do Xuan Giu (Vietnamese Air Force, Office of the Surgeon, Tan Son Nhut Air Base, South Vietnam).
IN: AVIATION AND SPACE MEDICINE; PROCEEDINGS OF THE SEVENTEENTH INTERNATIONAL CONGRESS, OSLO, NORWAY, AUGUST 5-8, 1968. (A69-41783 23-05)
Edited by Birger Hannisdahl and C. W. Sem-Jacobsen.
Oslo, Universitetsforlaget, 1969, p. 219-222.

Study of night vision requirements in order to determine a possible causal relationship to a fatal crash of a Skyraider during its second attempt at strafing a target at night and to a crash landing of an H34 helicopter on a ricefield full of water when the ground illumination suddenly changed due to burnout of overhead flares. It is concluded that: (1) for quick reaction in the combat theatre at night when involved in long night flight missions (especially when the pilot must use cone vision to read instruments), the basic rules for maintaining the most efficient night vision in combat situation be applied; and (2) after a sudden intense illumination by overhead flares or when there is sustained ground illumination by repeated flares or ground lights, preflight dark adaptation offers no advantage, since the ambient light level is always in the photopic range. To facilitate transition of the pilot's visual reference from the outside glare to the darkened cockpit for the purpose of cross-checking instruments, an instrument-lighting system whereby the pilot can select either red or white light according to his state of dark adaptation is the optimal system. Use of a bill-cap protective head gear by the pilot would afford some degree of shielding to avoid flare-glare and dazzle while flying into the path of descending flares. Use of a landing light during the terminal phase of landing would ensure that sudden loss of flare illumination does not precipitate a bad landing. (Author)

A69-41808
STARTLE STIMULUS, PERFORMANCE AND VEGETATIVE REACTIONS OF MEN.
Marian Vlasák (Institute of Aviation Medicine, Prague, Czechoslovakia).
IN: AVIATION AND SPACE MEDICINE; PROCEEDINGS OF THE SEVENTEENTH INTERNATIONAL CONGRESS, OSLO, NORWAY, AUGUST 5-8, 1968. (A69-41783 23-05)
Edited by Birger Hannisdahl and C. W. Sem-Jacobsen.
Oslo, Universitetsforlaget, 1969, p. 223-226.

Investigation of the effect of the sudden sound of a klaxon hooter (100 dB at 1 m distance) on the sensomotor activity of the hand and on standing stability. As regards the sensomotor activity of the hand immediately after the startle stimulus, incorrect reactions were seen in 73 per cent of the subjects. The titubative motions in standing on the right leg without visual control after the sharp sound lasting 15 second deteriorated significantly. In another group of healthy men a study was made of the changes of pulse rate, breathing activity, and psychogalvanic reaction at rest and during the performance tests. It was found that the pulse rate did not change significantly, but the breathing activity and psychogalvanic reaction did. It is suggested that the startle stimulus can be the cause of pilot error. (Author)

A69-41809
HELICOPTER EVACUATION—A PRIME SOLUTION.
S. H. Neel (U.S. Army, Washington, D.C.).
IN: AVIATION AND SPACE MEDICINE; PROCEEDINGS OF THE SEVENTEENTH INTERNATIONAL CONGRESS, OSLO, NORWAY, AUGUST 5-8, 1968. (A69-41783 23-05)
Edited by Birger Hannisdahl and C. W. Sem-Jacobsen.
Oslo, Universitetsforlaget, 1969, p. 229-235.

Summary of Army experience with helicopter evacuation in battle in Korea and Vietnam and during peace-time operations within the continental U.S. The important role of helicopter evacuation in reducing the mortality rate among wounded is pointed out. The introduction of helicopters in Korea during the Korean war is discussed, and organizational aspects of air ambulance units are described. A summary of major lessons learned which apply to the problem of improving civilian emergency medical support within the U.S. is presented. G.R.

A69-41810 *
STUDIES ON ARCTIC SURVIVAL.
T. A. Rogers (Hawaii, University, School of Medicine, Dept. of Physiology, Honolulu, Hawaii) and E. G. Aksnes (Sentralsjukhuset, Stavanger, Norway).
IN: AVIATION AND SPACE MEDICINE; PROCEEDINGS OF THE SEVENTEENTH INTERNATIONAL CONGRESS, OSLO, NORWAY, AUGUST 5-8, 1968. (A69-41783 23-05)
Edited by Birger Hannisdahl and C. W. Sem-Jacobsen.
Oslo, Universitetsforlaget, 1969, p. 236-240. 5 refs.
Grant No. NGR-12-001-020; Contract No. AF 41(609)-2989.

Experimental investigation of various kinds of Arctic survival situations aircrews may encounter. The clinical course of a "static" situation without food has been characterized by detailed physiological monitoring. The experiments show that the fluid and electrolyte derangements can be countered by appropriate design of survival rations. Similarly detailed physiological and clinical studies have been made on groups of scientific personnel traveling 200 km on snowshoes across country in the Arctic. P.G.

A69-41811
PROBLEMS OF SURVIVAL RESULTING FROM PASSENGER AIRCRAFT ACCIDENTS IN THE ARCTIC.
M. F. Hawkins (Aeromedical and Safety Training School, Salisbury, Wilts., England).
IN: AVIATION AND SPACE MEDICINE; PROCEEDINGS OF THE SEVENTEENTH INTERNATIONAL CONGRESS, OSLO, NORWAY, AUGUST 5-8, 1968. (A69-41783 23-05)
Edited by Birger Hannisdahl and C. W. Sem-Jacobsen.
Oslo, Universitetsforlaget, 1969, p. 241-243.

Discussion of measures which can be taken to ensure passenger safety during aircraft accidents in the Arctic, without the benefit of full survival equipment for all the passengers. The suitability of the aircraft as a shelter against the hazards of cold is demonstrated, and aids to location and rescue are described. A list of mandatory survival equipment is included. T.M.

A69-41812
ATTEMPT AT RATIONAL TREATMENT OF THE PROBLEM OF MEDICAL AID AFTER AIRCRAFT ACCIDENTS AT THE AIRPORT (TENTATIVE DE TRAITEMENT RATIONNEL DU PROBLEME DES SECOURS MEDICAUX APRES ACCIDENT AERIEN SUR AEROPORT).
G. Bergot (Aéroport de Paris, Orly, France).
IN: AVIATION AND SPACE MEDICINE; PROCEEDINGS OF THE SEVENTEENTH INTERNATIONAL CONGRESS, OSLO, NORWAY, AUGUST 5-8, 1968. (A69-41783 23-05)
Edited by Birger Hannisdahl and C. W. Sem-Jacobsen.
Oslo, Universitetsforlaget, 1969, p. 245-249. In French.

Study of a general methodology of medical aid organization at airports in connection with the approaching increase in large capacity passenger transports. The probabilities of injury in an accident are examined by statistical methods, and the probable number of injuries for which facilities should be maintained is estimated. The infrastructure of the district medical and hospital aid is analyzed with regard to the fixed and mobile facilities. The number of facilities which must be installed in order to secure immediate and appropriate intervention in case of an accident is determined. P.G.

A69-41813
ADVANTAGE OF NONSURGICAL METHODS OF MEASURING CARDIAC OUTPUT IN AEROSPACE MEDICINE (INTERET DES METHODES NON SANGLANTES DE MESURE DU DEBIT CARDIAQUE EN MEDECINE AERONAUTIQUE ET SPATIALE).
J. Pernod, J. Demange, R. Carré, P. Hardel, and J. Kermarec (Hôpital Militaire Percy, Clarnart, Hauts-de-Seine, France).
IN: AVIATION AND SPACE MEDICINE; PROCEEDINGS OF THE SEVENTEENTH INTERNATIONAL CONGRESS, OSLO, NORWAY, AUGUST 5-8, 1968. (A69-41783 23-05)
Edited by Birger Hannisdahl and C. W. Sem-Jacobsen.
Oslo, Universitetsforlaget, 1969, p. 255-259. 9 refs. In French.

Description of the measurement of cardiac output by two nonsurgical techniques involving (1) simultaneous recording of carotid and femoral pulses, and (2) impedance plethysmography. The first method involves measurements of the duration of the cardiac cycle, the duration of carotid ejection, and the flow velocity between the carotid and the femoral arteries. The cardiac output is calculated from a formula containing these measured elements. The second method involves measurements of the electrical impedance of the thorax in the course of the cardiac cycle. The effectiveness of both techniques is compared with that of surgical methods from the viewpoint of constraints imposed in aerospace medicine. T.M.

A69-41814
THE SYNTHESIS OF HEMOPROTEIDS IN THE LIGHT OF BIOCHEMICAL EVOLUTION.
G. Schäfer (Deutsche Versuchsanstalt für Luft- und Raumfahrt, Institut für Flugmedizin, Bad Godesberg, West Germany).
IN: AVIATION AND SPACE MEDICINE; PROCEEDINGS OF THE SEVENTEENTH INTERNATIONAL CONGRESS, OSLO, NORWAY, AUGUST 5-8, 1968. (A69-41783 23-05)
Edited by Birger Hannisdahl and C. W. Sem-Jacobsen.
Oslo, Universitetsforlaget, 1969, p. 260-262.

Discussion of the evolutionary background of the synthesis of porphyrin compounds forming the base of hemoproteids. It is noted that the porphyrin compounds and the nitrogeneous bases of nucleic acids show high thermodynamic stability—i.e., a high degree of delocalization of their pi electrons. The functional centers of high chemical activity in porphyrin, as well as in the purine- and pyridine-bases of the nucleic acids, consist of two types of nitrogen atoms in heterocyclic molecules: secondary pyrrole-type nitrogen with three single bonds, one of them containing hydrogen, and tertiary pyridine-type nitrogen with one double bond. It is stressed that only biological tissue is able to incorporate iron into protoporphyrin. P.G.

A69-41815
EFFECTS OF PHYSICAL AND PSYCHIC STRESS ON PHOSPHATIDYL GLYCEROL AND RELATED PHOSPHOLIPIDS IN HUMANS AND ANIMALS.
B. D. Polis, H. P. Schwarz, E. Polis, and L. Dreisbach (U.S. Naval Material Command, Naval Air Development Center, Aerospace Medical Research Dept., Johnsville, Pa.).
IN: AVIATION AND SPACE MEDICINE; PROCEEDINGS OF THE SEVENTEENTH INTERNATIONAL CONGRESS, OSLO, NORWAY, AUGUST 5-8, 1968. (A69-41783 23-05)
Edited by Birger Hannisdahl and C. W. Sem-Jacobsen.
Oslo, Universitetsforlaget, 1969, p. 263-270. 8 refs.

Investigation of changes in plasma phosphatidyl glycerol and related plasma phospholipids due to different types of stress. Chromatographic analysis of phospholipids in the tissue and plasma of rats exposed to lethal levels of ionizing radiation or acceleration stress yielded a consistent pattern of increased concentrations of phosphatidyl glycerol. Extension of the studies to humans stressed by acceleration to grayout, sleep deprivation, schizophrenia, combat, etc., revealed that all stresses were accompanied by significant increments in plasma phosphatidyl glycerol. Moreover, the stressed populations could be distinguished from each other when the changes in phosphatidyl glycerol were related to concomitant variations in seven other phospholipids. From the experimental results obtained it is suggested that "chemical" centers of the brain can interpret certain sensory inputs as "threats to survival" and react by mobilizing biochemical factors at a molecular level. P.G.

A69-41816
EARLY BRAIN ATROPHIES.
V. O. Savić, N. Dekleva, and I. Milosavljević.

IN: AVIATION AND SPACE MEDICINE; PROCEEDINGS OF THE SEVENTEENTH INTERNATIONAL CONGRESS, OSLO, NORWAY, AUGUST 5-8, 1968. (A69-41783 23-05)
Edited by Birger Hannisdahl and C. W. Sem-Jacobsen.
Oslo, Universitetsforlaget, 1969, p. 281-285. 23 refs.

Discussion of techniques for the diagnosis of early brain atrophies, using only purely clinical methods aided by biochemical analyses. The term atrophy is taken to mean a diminished number and function of tissues that is very often the consequence of disturbed circulation, innervation, endocrinal functions, and intoxication. Contrary to degeneration and necrosis, atrophy is pathophysiologically more tied to the multicellular system. Statistics show that the highest frequency of occurrence is in persons between 31 and 35 years of age. Symptoms are listed which can be used to control the incidence of this affliction among aviation personnel. T.M.

A69-41817
DISTURBANCES OF THE BALANCE SYSTEM IN MAN DURING ALCOHOLIC HANGOVER.
M. Bergstedt (Sahlgren's Hospital, Dept. of Otolaryngology, Göteborg, Sweden).
IN: AVIATION AND SPACE MEDICINE; PROCEEDINGS OF THE SEVENTEENTH INTERNATIONAL CONGRESS, OSLO, NORWAY, AUGUST 5-8, 1968. (A69-41783 23-05)
Edited by Birger Hannisdahl and C. W. Sem-Jacobsen.
Oslo, Universitetsforlaget, 1969, p. 286-294. 11 refs.

Description of the effect of alcohol on the balance system of man, especially during the hangover period, from the viewpoint of the demands of flying. It is found that alcohol causes distinct disturbances of the ocular-vestibular system in man during the hangover period even after small doses. This disturbance is an induced ocular nystagmus movement related to the position of the head relative to the gravitational field. The physiological relation of this disturbance to the vestibular (balance) system is clear. Its importance as one of the physiological alterations during hangover is stressed. Z.W.

A69-41818
OUT-OF-TIME OPERATIONS IN CAVES (OPERATIONS HORS DU TEMPS EN CAVERNE).
Michel Siffre (Institut Français de Spéléologie, Nice, France).
IN: AVIATION AND SPACE MEDICINE; PROCEEDINGS OF THE SEVENTEENTH INTERNATIONAL CONGRESS, OSLO, NORWAY, AUGUST 5-8, 1968. (A69-41783 23-05)
Edited by Birger Hannisdahl and C. W. Sem-Jacobsen.
Oslo, Universitetsforlaget, 1969, p. 295-299. In French.

Experimental study of the time evolution in several human physiological rhythms and of the associated phenomena of desynchronization and resynchronization in the case of four subjects confined in caves for periods ranging from two to six months. In two experiments a natural alteration from a sleep-wakefulness circadian rhythm to a bicircadian rhythm was found. This bicircadian rhythm can be maintained for several weeks without any damage to the organism, with 34 hr of continuous activity and 14 hr of sleep per cycle. According to the experiments, a circadian-rhythm internal synchronization is observed, or a significant desynchronization, particularly between the central temperature rhythm and the sleep-wakefulness rhythm. Z.W.

A69-41820
HUMAN ENGINEERING OF SST—MAN'S ROLE IN ADVANCED AIRCRAFT OPERATIONS.
S. J. Gerathewohl (Federal Aviation Administration, Office of Aviation Medicine, Washington, D.C.) and J. Gannett (Federal Aviation Administration, Office of Aviation Medicine, Washington, D.C.; Boeing Co., Seattle, Wash.).
IN: AVIATION AND SPACE MEDICINE; PROCEEDINGS OF THE SEVENTEENTH INTERNATIONAL CONGRESS, OSLO, NORWAY, AUGUST 5-8, 1968. (A69-41783 23-05)
Edited by Birger Hannisdahl and C. W. Sem-Jacobsen.
Oslo, Universitetsforlaget, 1969, p. 308-319. 16 refs.

Discussion of the operational requirements of the flight crew with regard to a human engineering program which was established in order to achieve maximum human efficiency and man/machine compatibility in supersonic aircraft. Some aspects of the pilot's role in advanced aircraft operations are considered, and pertinent flight management concepts are developed. Some of the theoretical work concerned with establishing the transfer functions of the pilot is reviewed, and its application to the human factors engineering of the SST is considered. The information requirements are discussed, and some specific examples of advanced flight instrumentation applicable to supersonic transport conditions are illustrated. It is expected that more advanced technology and engineering would compensate at least partially for the increased complexity and handling difficulties of the system. P.G.

A69-41821
THE INFLUENCE OF STATURE AND PHYSICAL FITNESS ON TILT-TABLE AND ACCELERATION TOLERANCE.
K. E. Klein, H. Brüner, D. Jovy, L. Vogt, and H. M. Wegmann (Deutsche Versuchsanstalt für Luft- und Raumfahrt, Institut für Flugmedizin, Bad Godesberg, West Germany).
IN: AVIATION AND SPACE MEDICINE; PROCEEDINGS OF THE SEVENTEENTH INTERNATIONAL CONGRESS, OSLO, NORWAY, AUGUST 5-8, 1968. (A69-41783 23-05)
Edited by Birger Hannisdahl and C. W. Sem-Jacobsen.
Oslo, Universitetsforlaget, 1969, p. 323-329. 25 refs.
(For abstract see issue 22, page 3889, Accession no. A69-39940)

A69-41822
BLOOD PRESSURE RESPONSE TO POSITIVE ACCELERATION IN FLIGHT AND ON THE CENTRIFUGE.
L. Pircher (Swiss Air Force, Aeromedical Institute, Dübendorf, Switzerland).
IN: AVIATION AND SPACE MEDICINE; PROCEEDINGS OF THE SEVENTEENTH INTERNATIONAL CONGRESS, OSLO, NORWAY, AUGUST 5-8, 1968. (A69-41783 23-05)
Edited by Birger Hannisdahl and C. W. Sem-Jacobsen.
Oslo, Universitetsforlaget, 1969, p. 330-332.

Comparison of telemetry measurements of the response of blood pressure to positive acceleration in actual jet flight with the blood pressure measurements obtained on centrifuge tests. Results show that blood pressure response to positive acceleration is practically the same in flight as on the centrifuge, exhibiting a similar acceleration profile. Blood pressure at the level of the heart increases during acceleration, reaching levels of 180/125 mm Hg at 4 g. T.M.

A69-41823
THE EFFECT OF POSITIVE ACCELERATION UPON CARDIAC OUTPUT AND REGIONAL BLOOD FLOW IN THE DOG.
D. H. Glaister (Royal Air Force, Institute of Aviation Medicine, Farnborough, Hants., England).
IN: AVIATION AND SPACE MEDICINE; PROCEEDINGS OF THE SEVENTEENTH INTERNATIONAL CONGRESS, OSLO, NORWAY, AUGUST 5-8, 1968. (A69-41783 23-05)
Edited by Birger Hannisdahl and C. W. Sem-Jacobsen.
Oslo, Universitetsforlaget, 1969, p. 333-338.

Determination of the fractional distribution of cardiac output in 22 greyhound dogs using a modification of the radioisotope uptake technique of Sapirstein (1958). Nine of the dogs served as controls, while 13 were studied during exposure to positive acceleration, four at 2.6 G, and nine at 4.2 G. Cardiac outputs were determined in 20 of the dogs, using dye dilution. After 60 sec at peak acceleration, a solution of radioactive rubidium chloride (containing approximately

100 millicuries of ^{86}Rb) was injected into the right atrium, together with 2.5 mg of indocyanine green. The animals were killed 1 to 2 min later by an intra-atrial injection of 10 ml saturated potassium chloride, and the centrifuge was then stopped. Representative tissues were sampled at autopsy and their uptake of $^{86}RbCl$ determined using a well scintillation counter. The tissues studied included blood, skin, skeletal muscle and diaphragm, heart, lung, kidney and adrenal, liver, spleen, gut and pancreas. Exposure to acceleration produced gross but often inconsistent changes in the distribution of the cardiac output, although the fraction going to the adrenals rose in all dogs and that to the heart in all but one. The blood flow to the diaphragm rose, while that to other skeletal muscles fell. A gross reduction in kidney blood flow was seen in three dogs at 4.2 G and in one dog at 2.6 G. These and other results are discussed in relation to the vasomotor response to acceleration stress. (Author)

A69-41824 *

A TECHNIQUE PERMITTING EVALUATION OF CARDIOVASCULAR CHANGES INDUCED BY LONG-TERM WEIGHTLESSNESS.

V. P. Popovic and Pava Popovic (Emory University, Medical School, Dept. of Physiology, Atlanta, Ga.).

IN: AVIATION AND SPACE MEDICINE; PROCEEDINGS OF THE SEVENTEENTH INTERNATIONAL CONGRESS, OSLO, NORWAY, AUGUST 5-8, 1968. (A69-41783 23-05)

Edited by Birger Hannisdahl and C. W. Sem-Jacobsen.

Oslo, Universitetsforlaget, 1969, p. 339-343. 18 refs.

Grant No. NGR-11-001-009.

Description of a technique permitting long-lasting cardiovascular studies and evaluation of cardiovascular changes induced by long-term weightlessness without detrimental use of anesthesia and restraint. The application of this technique to an extensive study of 380 rats, 90 squirrel monkeys, and 28 mice, is described. The results show that the physiological and psychophysiological state of the animals after cannulation is unchanged; the cannulated animals withstood exposure to the increased g-forces of simulated flight as well as the control animals. It is thus demonstrated that this technique permits measurements of cardiovascular characteristics of unanesthetized and unrestrained animals by adequate direct methods before or after long-term space flights, permitting an evaluation of the effects of an extended weightlessness upon circulation. O.H.

A69-41825 #

PULMONARY FUNCTION DURING ZERO-GRAVITY MANEUVERS.

J. F. Tomashefski (Ohio State University, College of Medicine, Columbus, Ohio) and Mary F. Foley.

(*Aerospace Medicine*, vol. 40, June 1969, p. 655-657.)

IN: AVIATION AND SPACE MEDICINE; PROCEEDINGS OF THE SEVENTEENTH INTERNATIONAL CONGRESS, OSLO, NORWAY, AUGUST 5-8, 1968. (A69-41783 23-05)

Edited by Birger Hannisdahl and C. W. Sem-Jacobsen.

Oslo, Universitetsforlaget, 1969, p. 344-347. 7 refs.

(For abstract see issue 17, page 2909, Accession no. A69-33181)

A69-41826

DRY CABIN ENVIRONMENT, DEHYDRATION, AND RENAL CALCULUS IN AIRCREW.

P. R. Richards (Air Corporations Joint Medical Service, London Airport, Hounslow, Middx., England).

IN: AVIATION AND SPACE MEDICINE; PROCEEDINGS OF THE SEVENTEENTH INTERNATIONAL CONGRESS, OSLO, NORWAY, AUGUST 5-8, 1968. (A69-41783 23-05)

Edited by Birger Hannisdahl and C. W. Sem-Jacobsen.

Oslo, Universitetsforlaget, 1969, p. 351-356. 13 refs.

Study of the incidence of renal calculus among aircrews of long-haul and short-haul airlines, and in similar land-based populations. There was a significantly higher incidence in the long-haul airline aircrew, but this was probably due to the tropical routes flown. The incidence of renal calculus was not significantly higher in either airline than in the land-based populations. It is probable that the modern working environment of aircrews has no effect on the formation of renal calculus in the two airlines investigated. (Author)

A69-41827

PHYSIOLOGICAL AND PSYCHOTECHNICAL CRITERIA FOR THE ARRANGEMENT OF DIALS AND CLOCKS IN THE PILOT'S COCKPIT.

W. Dybowski (USAF, Medical Laboratory Center, London, England).

IN: AVIATION AND SPACE MEDICINE; PROCEEDINGS OF THE SEVENTEENTH INTERNATIONAL CONGRESS, OSLO, NORWAY, AUGUST 5-8, 1968. (A69-41783 23-05)

Edited by Birger Hannisdahl and C. W. Sem-Jacobsen.

Oslo, Universitetsforlaget, 1969, p. 357-361.

Discussion of techniques which can be used to improve the efficiency of an aircraft pilot's surveillance of flight indicators. It is argued that the total number of clocks and dials which must be read by the pilot is too high. The sizes of the dials are deemed acceptable, but it is stressed that alarms must be devised to alert the pilot of danger readings in dials with slowly changing indications. Possible methods of attracting the pilot's attention are described. Tests are considered for evaluating dial arrangements with respect to tiredness, boredom, and loss of concentration experienced by the pilot. T.M.

A69-41828

HUMAN FACTORS IN AIR TRAFFIC CONTROL.

G. Castle (Board of Trade, Medical Branch, London, England).

IN: AVIATION AND SPACE MEDICINE; PROCEEDINGS OF THE SEVENTEENTH INTERNATIONAL CONGRESS, OSLO, NORWAY, AUGUST 5-8, 1968. (A69-41783 23-05)

Edited by Birger Hannisdahl and C. W. Sem-Jacobsen.

Oslo, Universitetsforlaget, 1969, p. 362-366.

Study emphasizing the need to reckon with the whole man and his whole environment in considering his work performance and the various ways and means of obtaining improvement. It is pointed out that it is not enough to design new systems and install new equipment affording greater facility in the handling of information, if the capabilities of man and all the factors that affect him are not taken into account. His whole life, both at home and at work, his mental and physical well-being, must all be given adequate consideration, or the attempt to achieve improvement in work performance may result in failure. (Author)

A69-41829

FLIGHT-DECK VISION AND THE AGING EYE.

C. R. Harper and G. J. Kidera (United Air Lines, Inc., Elk Grove Township, Ill.).

(*Aerospace Medicine*, vol. 39, Oct. 1968, p. 1119-1122.)

IN: AVIATION AND SPACE MEDICINE; PROCEEDINGS OF THE SEVENTEENTH INTERNATIONAL CONGRESS, OSLO, NORWAY, AUGUST 5-8, 1968. (A69-41783 23-05)

Edited by Birger Hannisdahl and C. W. Sem-Jacobsen.

Oslo, Universitetsforlaget, 1969, p. 367-372.

(For abstract see issue 23, page 4359, Accession no. A68-44127)

A69-41831

NECESSITY OF USING THE DIRECT CORRELATIONS BETWEEN THE DAMAGES CAUSED AND THE TRAJECTORIES IN THE STUDY OF THE BIOLOGICAL EFFECTS OF HEAVY IONS IN COSMIC RADIATION (NECESSITE D'UTILISER LES CORRELATIONS DIRECTES ENTRE LES DOMMAGES CAUSES ET LES TRAJECTOIRES DANS L'ETUDE DES EFFETS BIOLOGIQUES DES IONS LOURDS DU RAYONNEMENT COSMIQUE).

G. Deltour, A. Pfister (Centre d'Enseignement et de Recherches de Médecine Aéronautique, Paris, France), R. Kaiser (Strasbourg, Centre de Recherches, Strasbourg, France), and L. Miro.
IN: AVIATION AND SPACE MEDICINE; PROCEEDINGS OF THE SEVENTEENTH INTERNATIONAL CONGRESS, OSLO, NORWAY, AUGUST 5-8, 1968. (A69-41783 23-05)
Edited by Birger Hannisdahl and C. W. Sem-Jacobsen.
Oslo, Universitetsforlaget, 1969, p. 382-385. 21 refs. In French.

Discussion of balloon probe studies, performed in France, concerning the radiation damage due to the heavy ion component of cosmic rays and to powerful solar flares. Some purely qualitative data obtained with small test animals and bacteriological samples are reviewed. As a means of obtaining a quantitative technique for evaluating radiation damage, it is proposed to study the ionization "cylinders" (local damage) produced by individual particles in living matter. The best correlation might be obtained with the aid of homogeneous mixtures of nuclear emulsions and bacteria. V.P.

A69-41832 *
RESISTANCE TO INFECTION IN SPACE-CABIN ENVIRONMENT.
R. Ehrlich and B. J. Mieszkuc (IIT Research Institute, Chicago, Ill.).
IN: AVIATION AND SPACE MEDICINE; PROCEEDINGS OF THE SEVENTEENTH INTERNATIONAL CONGRESS, OSLO, NORWAY, AUGUST 5-8, 1968. (A69-41783 23-05)
Edited by Birger Hannisdahl and C. W. Sem-Jacobsen.
Oslo, Universitetsforlaget, 1969, p. 386-392. 12 refs.
Contracts No. NAS 9-4978; No. NAS 9-7180.

Study of the effects of a simulated space-cabin environment, represented by 27,000-ft altitude (5 psi), 98 per cent oxygen atmosphere, 25 deg C, and 50 per cent relative humidity, on the resistance to infection. Enhanced mortality was observed in mice maintained in the space-cabin environment for up to 30 days and challenged by the respiratory route with airborne *K. pneumoniaes*. The reduced resistance to bacterial pneumonia persisted for approximately 72 hr after return to ambient environment, and the persistence was not related to the duration of the space-cabin environment exposure. The effect of the space-cabin environment on resistance to infection caused by influenza virus is also discussed.
(Author)

A69-41833 *
RELEVANCE OF A SPACE-RESEARCH CENTRIFUGE TO FUTURE SPACE-FLIGHT PROGRAMS.
B. D. Newsom (General Dynamics Corp., Convair Life Science Laboratory, San Diego, Calif.).
IN: AVIATION AND SPACE MEDICINE; PROCEEDINGS OF THE SEVENTEENTH INTERNATIONAL CONGRESS, OSLO, NORWAY, AUGUST 5-8, 1968. (A69-41783 23-05)
Edited by Birger Hannisdahl and C. W. Sem-Jacobsen.
Oslo, Universitetsforlaget, 1969, p. 393-399.
Contract No. NAS 1-7309.

Discussion of the use of a centrifuge on board an orbiting vehicle as a research tool to study problems of prolonged missions and advanced spacecraft design. The practicality of research programs that determined the requirements of the facility is examined. The biological experiments developed to date are listed together with the physical experiments which are intended to provide information in experimental areas that cannot be duplicated on the earth. T.M.

A69-41870
THE FEELING OF DAMPNESS AT LOW TEMPERATURES.
M. R. Piggott (Toronto, University, Dept. of Chemical Engineering and Applied Chemistry, Toronto, Canada).
International Journal of Biometeorology, vol. 13, June 1969, p. 81-86. 5 refs.

Investigation of the correlation between the subjective feeling of dampness and relative humidity of air at temperatures between -40 and 0 deg C. Experiments were made with six subjects who commented on coldness and dampness after walking 800 m in the open in winter in one of the colder parts of Eastern Canada. Their comments were compared with measurements of temperature and relative humidity. Wind speed and direction, cloud cover, and visibility of the sun were determined. The most consistent effect observed in this investigation is that the panel considered the atmosphere to be dry when the sun was shining, irrespective of relative humidity or total water content. When this factor was allowed for, it was apparent that the panelists' predictions of humidity were not very consistent or accurate, but the average of individual comments on dampness did show some slight and significant correlation with actual humidity. P.G.

A69-41871
HUMAN FACTORS IN THE ALL-WEATHER APPROACH.
J. M. Naish and M. F. von Wieser (McDonnell Douglas Corp., St. Louis, Mo.).
Shell Aviation News, no. 374, 1969, p. 2-11. 5 refs.

Study of effects that normally diminish the value of a manually flown instrument approach on the basis of flight test results with the head-up display. It is found that it is possible to avoid shortsightedness and disorientation phenomena associated with poor external visibility by choice of display position and format, allowing an efficient alternation between display and forward view. The display can also be designed to fit the man, in both static and dynamic characteristics, with benefits of rapid learning and accurate tracking. These results remove the basis for supposing human intervention in all-weather landing to be disastrous. On the other hand, human participation may be necessary, because more information is connected with a safe approach than can be dealt with by an unaided machine. Synthesis of an automatic system with the head-up display may turn out to be the most acceptable solution to the overall problem of all-weather operation. G.R.

A69-41955 #
SIGNAL IDENTIFICATION AGAINST A BACKGROUND OF NOISE BY A HUMAN OPERATOR AND AN AUTOMATION (OTOZHDESTVLENIE SIGNALOV NA FONE SHUMA CHELOVEKOM-OPERATOROM I AVTOMATOM).
I. A. Zamiatin and V. V. Lipaev.
Akademiia Nauk SSSR, Izvestiia, Tekhnicheskaia Kibernetika, May-June 1969, p. 136-142. In Russian.

Analysis of the process of identification of groups of point images with reference groups of points by a human operator having incomplete visual perception in the presence of noise. The characteristics of this process are obtained and are compared with those of the same operation performed by an automatic system using a successive selection algorithm. The human operator is observed to perform such signal identification problems better than the automatic system. A procedure for synthesizing quasi-optimal signal identification algorithms is outlined. V.Z.

A69-41962
CURRENT TOPICS IN RADIATION RESEARCH. VOLUME 5.
Edited by Michael Ebert and Alma Howard (Christie Hospital and Holt Radium Institute, Paterson Laboratories, Manchester, England).
Amsterdam, North-Holland Publishing Co., 1969. 298 p.
$13.50.

CONTENTS:

FOREWORD. M. Ebert and A. Howard (Christie Hospital and Holt Radium Institute, Manchester, England). 1 p.

SOME RECENT STUDIES IN MOLECULAR RADIOBIOLOGY. K. G. Zimmer (Karlsruhe, Kernforschungszentrum, Karlsruhe, West Germany), p. 1-38. 61 refs. (See A69-41963 23-04)

RADIATION CHEMISTRY OF AQUEOUS FROZEN SOLU-

A69-41963

SOME RECENT STUDIES IN MOLECULAR RADIOBIOLOGY.

K. G. Zimmer (Karlsruhe, Kernforschungszentrum, Institut für Strahlenbiologie, Karlsruhe, West Germany).

IN: CURRENT TOPICS IN RADIATION RESEARCH. VOLUME 5. (A69-41962 23-04)

Edited by Michael Ebert and Alma Howard.

Amsterdam, North-Holland Publishing Co., 1969, p. 1-38. 61 refs.

Discussion of a series of interconnected studies dealing with the physicochemical processes caused by absorption of energy in targets (inactivation of plaque-forming ability of T1 phage by ionizing radiation) in order to understand the processes leading to inactivation under various circumambient conditions. The two limitations of early approaches—i.e., the assumption of linear proportionality of potentially effective damage to the net effects observed and the restriction of physical and physicochemical analysis to the occurrence of ionization within the structural or functional entity—are discussed. A detailed description is given of the following experimental studies dealing with the various problems involved: temperature dependence of radiation effects in phage and its infectious DNA, and in RNase; electron spin resonance studies of phage and its DNA, and of single crystals of DNA constituents; actions of atomic hydrogen on phage and its infectious DNA, and on RNase; studies of breakage and cross-linking of DNA in irradiated phage; actions of vacuum ultraviolet on infectious DNA isolated from phage ΦX 174. The results of these experiments are discussed. O.H.

A69-41964

THE INDUCTION AND REPAIR OF RADIATION DAMAGE IN CHLAMYDOMONAS.

D. Roy Davies (United Kingdom Atomic Energy Authority, Atomic Energy Research Establishment, Wantage Research Laboratory, Berks., England).

IN: CURRENT TOPICS IN RADIATION RESEARCH. VOLUME 5. (A69-41962 23-04)

Edited by Michael Ebert and Alma Howard.

Amsterdam, North-Holland Publishing Co., 1969, p. 75-113. 61 refs.

Study of the comparative sensitivity to UV and gamma radiation of haploid and diploid cell stages of the unicellular green alga *Chlamydomonas reinhardii*. It has been found that the various phases of the cell cycle of diploid cells differ in their response to gamma and UV radiation, and in the case of UV this has been shown to be due to a change in dark-repair activities. Whereas the photoreactivating system remains active, control mechanisms limit the level of dark repair activity at certain specific times, possibly as a result of the genetic recombination occurring in these cells. Radiosensitive mutants have been isolated; with these an analysis has been made of the genetic control of the repair of UV-induced lethal and mutational damage and of the nature of UV-induced reversion to prototrophy at one particular locus. One mutant is of particular interest in that it shows a greater sensitivity to sparsely ionizing radiation when irradiated in the absence of oxygen than in the presence of it. Detailed analyses are made of this and of a revertant strain which shows completely opposite effects of oxygen at different developmental stages. The effect of fractionating a given dose of sparsely and densely ionizing radiations is discussed, and the relation of dose rate effects to repair activities is considered. Finally, the comparative response of haploid and diploid cells to radiations of different linear energy transfer is described. O.H.

A69-41965

SYSTEM ASPECTS OF GRANULOPOIESIS AND RADIATION EFFECTS.

Harvey M. Patt and Mary A. Maloney (California, University, Medical Center, Laboratory of Radiobiology, San Francisco, Calif.).

IN: CURRENT TOPICS IN RADIATION RESEARCH. VOLUME 5. (A69-41962 23-04)

Edited by Michael Ebert and Alma Howard.

Amsterdam, North-Holland Publishing Co., 1969, p. 115-140. 71 refs.

AEC-sponsored research.

Study of the population kinetics of the complex and sensitive granulocyte system forming bone marrow and its behavior upon irradiation. The organization of the granulocyte system and its steady state is described, and its regulatory mechanisms are reviewed. The radiosensitivity of the constituent granulocytes and system aspects of radiation-induced granulocytopaenia are discussed in detail, and an attempt is made to relate the behavior of this system in the steady state to the evolution of various changes upon irradiation. It is concluded that, although many effects on the granulocyte system can be understood from the normal kinetics of the developmental pathway, it is not yet possible to make quantitative predictions about the response of this system in different species under different conditions of irradiation. O.H.

A69-41966

OXYGEN DIFFUSION AND OXYGEN DEPLETION PROBLEMS IN RADIOBIOLOGY.

J. W. Boag (Institute of Cancer Research, Physics Dept., Sutton, Surrey, England).

IN: CURRENT TOPICS IN RADIATION RESEARCH. VOLUME 5. (A69-41962 23-04)

Edited by Michael Ebert and Alma Howard.

Amsterdam, North-Holland Publishing Co., 1969, p. 141-195. 42 refs.

Discussion of a number of steady-state and time-dependent concentration gradients in and around cells due to oxygen diffusion and oxygen depletion which are frequently met in radiobiology. Diffusion is characterized as being the principal mode of transport of oxygen from the blood into tissue or, *in vitro*, from a nutrient medium to cells suspended in it. The diffusion gradients are modified by the removal of the diffusing substance from solution either through metabolic reactions in cells or through radiation-induced reactions in the surrounding medium. Both these conditions are formulated mathematically, and various graphical solutions are presented in the simplest and most uniform manner for a number of common experimental situations. The problems dealt with are classified, first, into steady-state and time-dependent groups and, second, according to their geometrical symmetry—i.e., whether the flow is linear along one axis only, radial in two dimensions, or radial in three dimensions. O.H.

A69-41967

THE OXYGEN EFFECT IN RADIATION THERAPY.

H. A. S. Van den Brenk (St. Thomas' Hospital, Richard Dimbleby Research Laboratory, London, England).

IN: CURRENT TOPICS IN RADIATION RESEARCH. VOLUME 5. (A69-41962 23-04)

Edited by Michael Ebert and Alma Howard.
Amsterdam, North-Holland Publishing Co., 1969, p. 197-254. 91 refs.

Study evaluating the role of the oxygen effect in clinical radiotherapy and analyzing, on a cellular basis, various strategies attempting to overcome the radioresistance of tumors attributed to lack of oxygen, with particular emphasis on the use of oxygen at raised pressure during irradiation. The process of tissue oxygenation and the ways of tissue growth are explained. Quantitative aspects of dose-effect relationships in radiotherapy and the oxygen effect are considered, and fractionation in radiotherapy is discussed. General aspects of damage to normal tissues by radiotherapy and the radiosensitivity of special tissues in high-pressure oxygen are described. Factors affecting tumor clearance rates are reviewed, and special techniques based on the oxygen effect are discussed. O.H.

A69-41976 #
PLANNING OF BEHAVIOR ON THE BASIS OF RECEIVED INFORMATION (PLANIROVANIE POVEDENIIA NA OSNOVE VOSPRINIATOI INFORMATSII).
N. M. Amosov and S. A. Talaev (Akademiia Nauk Ukrainskoi SSR, Institut Kibernetiki, Kiev, Ukrainian SSR).
Problemy Bioniki, no. 1, 1968, p. 3-9. In Russian.

Description of a system which is capable of selecting a certain sequence of steps representing its behavior on the basis of certain information obtained by the system. The system consists of two subsystems—namely, the sensory sphere and the logic sphere. The sensory sphere is subdivided into perception, sense, and desire levels, while the logic sphere is composed of concept and criteria levels. Close interaction between the two subsystems and all their levels results in the formulation of a plan to proceed between two cells of an aggregate of cells by selecting cells between these two initial cells in such a way that the set of selected cells forms a path of minimum length between the initial cells or satisfies some given requirements. G.R.

A69-41977 #
LEARNING MODEL OF MOTOR BEHAVIOR (SAMOOBUCHAIUSHCHAIASIA MODEL' DVIGATEL'NOGO POVEDENIIA).
N. M. Amosov and A. M. Kasatkin (Akademiia Nauk Ukrainskoi SSR, Institut Kibernetiki, Kiev, Ukrainian SSR).
Problemy Bioniki, no. 1, 1968, p. 10-18. 9 refs. In Russian.

Description of a system which models several information processing programs in the brain cortex of higher animals and man which are connected with the organization of motor behavior. Fundamental concepts and terminology are introduced. The general construction of a system called the "M-automaton" is described, and algorithms for its operation are presented. Various parts of the system dealing with the reception of information, correlation, memory, emotions, desires and actions are discussed. An amplification and inhibition system for use in the M-automaton is described, and an account is given of the operation of the M-automaton. G.R.

A69-41978 #
THE PROBLEM OF MATHEMATICAL SIMULATION OF HUMAN VISION (O ZADACHE MATEMATICHESKOGO MODELIROVANIIA ZRENIIA CHELOVEKA).
Iu. P. Shabanov-Kushnarenko (Khar'kovskii Institut Radioelektroniki, Kharkov, Ukrainian SSR).
Problemy Bioniki, no. 1, 1968, p. 19-28. In Russian.

Description of an approach to the development of a mathematical formulation for the relation between the parameters of an optical input signal to the human eye and the visual impression obtained in response by the observer. A black-box approach is used. Mathematical relations are presented which relate the parameters of a point on a surface to the parameters describing quantitative and qualitative aspects of the light entering the eye of the observer from this point. The parameters of the visual impression received by the observer are examined. They can be described by a radius vector directed toward points of an approximately spherical body. Aspects of a number of details in the mathematical formulation of the problem are discussed. G.R.

A69-41979 #
SIMULATION OF THE STATICS OF HEARING AND VISION ADAPTATION (MODELIROVANIE STATIKI ADAPTATSII SLUKHA I ZRENIIA).
Iu. P. Shabanov-Kushnarenko, G. F. Diubko, E. P. Putiatin, and M. F. Bondarenko (Khar'kovskii Institut Radioelektroniki, Kharkov, Ukrainian SSR).
Problemy Bioniki, no. 1, 1968, p. 29-38. In Russian.

Investigation of static mathematical relations regarding adaptation processes in human hearing and vision. A mathematical formulation is developed which relates the various parameters involved in the perception of sound by an individual, and the process of adaptation to various levels of sound intensity is considered. Deductions derived from the relations established are tested in a psychophysical experiment. Experimental data confirming the theoretical assumptions are presented. Dynamical reactions are not considered. The mathematical relations in an appropriate form are applied to adaptational processes in vision and are tested in experiments using a Maxwell disk. G.R.

A69-41980 #
INVESTIGATION OF SUBTHRESHOLD PHENOMENA IN EXCITED ELEMENTS ON AN ANALOG MODEL (ISSLEDOVANIE PODPOROGOVYKH IAVLENII V VOZBUDIMYKH ELEMENTAKH NA ANALOGOVOI MODELI).
Iu. P. Bugai, V. G. Chernov, and Iu. I. Nefedov (Khar'kovskii Institut Radioelektroniki, Kharkov, Ukrainian SSR).
Problemy Bioniki, no. 1, 1968, p. 39-48. 5 refs. In Russian.

Description of a model designed on the basis of direct analysis of the processes in subthreshold reactions in nerve and muscle tissues. The fundamental transient characteristics of the model in the presence of various excitations are discussed, and its properties in a periodic pulsed excitation mode of operation are considered. Particularities of the model and analog capabilities of excited elements for accommodation and adaptation are examined. A transistor model is discussed. G.R.

A69-41981 #
MODEL OF SUBTHRESHOLD PHENOMENA IN EXCITED ELEMENTS (MODEL' PODPOROGOVYKH IAVLENII V VOZBUDIMYKH ELEMENTAKH).
Iu. P. Bugai and V. G. Chervov (Khar'kovskii Institut Radioelektroniki, Kharkov, Ukrainian SSR).
Problemy Bioniki, no. 1, 1968, p. 49-59. 6 refs. In Russian.

Discussion of a model of nerve elements on the basis of fundamental physiological premises. The functional scheme of the model is described, and the results of an analog investigation of transient processes are presented for various stimuli at the model input. A parameter system required for the complete description of subthreshold processes is considered. The system includes accommodation and adaptation processes. G.R.

A69-41982 #
SIMULATION OF A BIOLOGICAL MEMORY (MODELIROVANIE BIOLOGICHESKOI PAMIATI).
E. V. Uteush (Khar'kovskii Institut Radioelektroniki, Kharkov, Ukrainian SSR).
Problemy Bioniki, no. 1, 1968, p. 60-66. In Russian.

Discussion of an approach to mathematical simulation of a biological memory as a cybernetic system. It is pointed out that the

information can be handled in the memory by means of a random search or by a definite transfer from one level of the memory to another. A mathematical model for information processing in the memory is proposed and analyzed. The required time for the transfer of information serves as a general criterion for these processes. G.R.

A69-41983 #
THE MEMORY OF CYBERNETIC SYSTEMS (O PAMIATI KIBERNETICHESKIKH SISTEM).
E. V. Uteush (Khar'kovskii Institut Radioelektroniki, Kharkov, Ukrainian SSR).
Problemy Bioniki, no. 1, 1968, p. 67-71. 6 refs. In Russian.

Discussion of a cybernetic approach to the study of memory. Hierarchical structural order and sequence, the dynamic character of information exchange processes between various memory levels, the flexibility and probabilistic nature of the feedbacks, controlling groups or types of memory, and the temporal and spatial organization of the memory are cited as important features of this approach. The memory model proposed is characterized by a hierarchical structure and a set of memory levels. An application of the model to the study of the rhythms of physiological processes is considered. G.R.

A69-41984 #
SIMULATION OF THE DYNAMICS OF VISION AND HEARING ADAPTATION (MODELIROVANIE DINAMIKI ADAPTATSII ZRENIIA I SLUKHA).
Iu. P. Shabanov-Kushnarenko, G. F. Diubko, E. P. Putiatin, and M. F. Bondarenko (Khar'kovskii Institut Radioelektroniki, Kharkov, Ukrainian SSR).
Problemy Bioniki, no. 1, 1968, p. 97-106. In Russian.

Study of the dynamic reactions of a mathematical model representing the adaptation process for vision and hearing. The fundamental mathematical relations are considered for a stepwise changing signal at the input of the model representing the adaptation process, and the visual sensation experienced in response to the signal is considered. Experimental data are presented which verify the correctness of the model. G.R.

A69-41985 #
CONSTRUCTION OF A MATHEMATICAL MODEL OF HUMAN VISION, TAKING INTO ACCOUNT ADAPTATION TO LIGHT (K POSTROENIIU MATEMATICHESKOI MODELI ZRENIIA CHELOVEKA S UCHETOM TSVETOVOI ADAPTATSII).
E. P. Putiatin, V. P. Pchelinov, and M. F. Bondarenko (Khar'kovskii Institut Radioelektroniki, Kharkov, Ukrainian SSR).
Problemy Bioniki, no. 1, 1968, p. 107-113. 7 refs. In Russian.

Discussion of the problems connected with the simulation of light adaptation in human vision. The results of an experimental investigation of the adaptation to light brightness on a Maxwell disk with two comparison fields are analyzed, and two possible mathematical models of vision, taking into account the light adaptation process, are described. G.R.

A69-42013 *
BROWN FAT AND THERMOGENESIS.
Robert Emrie Smith and Barbara A. Horwitz (California, University, School of Veterinary Medicine, Dept. of Physiological Sciences, Davis, Calif.).
Physiological Reviews, vol. 49, Apr. 1969, p. 330-425. 402 refs.
PHS Grant No. HD-03268-01; Grant No. NGR-05-004-035.

Study of the multilocular brown adipose tissue (brown fat) which provides an internal heating jacket that overlies parts of the systemic vasculature and on signal becomes an active metabolic heater applied directly to the flowing bloodstream as it passes to and from the cooler periphery, and thus has an important role for animals surviving in cold environments. Anatomical studies in various animals are reviewed, and the vasculature, innervation, and cytology of the brown adipose tissue are described. The development of this tissue and its composition in humans and in a variety of animals, as well as its changes in composition and morphology, as influenced by age and by various exogenous factors, such as temperature, season, hibernation, and various stressing agents, are described in detail. The hormonal influence resulting from seasonal variation in morphology and composition is analyzed, and its function, particularly its roles during the induction and maintenance of hibernation, is extensively reviewed. The general metabolic characteristics are given, and the metabolic basis and control of the brown adipose tissue are explained. O.H.

A69-42014 *
OBSERVING BEHAVIOR OF MENTAL PATIENTS UNDER A FIXED-INTERVAL SCHEDULE OF SIGNALS.
J. F. Dardano (Maryland, University, College Park, Md.).
Psychological Reports, vol. 24, 1969, p. 635-653. 23 refs.
Research supported by the Illinois Department of Mental Health; Grant No. NGR-21-002-004.

Application of a modified Holland procedure (1957) for measuring the performance of groups of mental patients and normal subjects in detecting and identifying certain visual signals occurring at 2-min intervals with a 15-sec limiting hold. The largely non-uniform performance of the mental patients in monitoring their responses is noted. The intrainterval pattern of skin conductance during the monitoring sessions did not show any gross differentiation between the two groups. V.Z.

A69-42015 *
LEADERSHIP ATTEMPTING—WHY AND WHEN?
Cabot L. Jaffee (Tennessee, University, Knoxville, Tenn.).
Psychological Reports, vol. 23, 1968, p. 939-946. 25 refs.
Grant No. NGL-43-001-021.

Study of leadership-attempting behavior in an effort to define the parameters involved and to describe the conditions under which it can be manipulated. Research shows that the likelihood of a given individual speaking in a group is quite complex and depends on a number of situational and perceptual variables. Moreover, leadership attempting may be modified by changing the situation or the perceptions of the individual to the point where reinforcement from within the group becomes necessary to maintain the leadership-attempting behavior. T.M.

A69-42016
EFFECT OF UNCERTAINTY ON RISK TAKING IN INDIVIDUAL AND GROUP DECISIONS.
Donald G. Marquis and H. Joseph Reitz (Massachusetts Institute of Technology, Dept. of Psychology, Cambridge, Mass.; Indiana University, Graduate School of Business, Bloomington, Ind.).
Behavioral Science, vol. 14, July 1969, p. 281-288. 13 refs.

Experimental gambling situations were used to test (1) the effects of uncertainty on individuals' willingness to take risks and (2) the effects of group discussion under conditions of positive, zero, and negative expected values. In all three experimental conditions, individuals risked less money under uncertainty. The comparison of group with individual decisions showed results consistent with a model which proposes that group discussion enhances prior expected values and also results in a risk bias effect when uncertainty is present. (Author)

A69-42017 *
A GROUP INTERACTION STOCHASTIC MODEL BASED ON BALANCE THEORETICAL CONSIDERATIONS.
Irwin D. Nahinsky (Missouri, University, Dept. of Psychology, Columbia, Mo.).

Behavioral Science, vol. 14, July 1969, p. 289-302. 19 refs. NASA-supported research.

Development of a finite Markov chain model to describe changes in dyadic interpersonal relationships. Balanced dyadic states were assumed to be absorbing states, and imbalanced dyadic states were assumed to be transient states. A balanced dyad was defined as one in which both members perceived the rewards of the relationship to be equal for the two members. Subsets of individuals within groups were considered from the standpoint of balanced dyadic relationships. A descriptive model for intragroup relationships was derived, and the descriptive model was related to the stochastic model for change in dyadic relationships. (Author)

A69-42021 *

VIRUSLIKE PARTICLES IN THE FAT BODY, OENOCYTES, AND CENTRAL NERVOUS TISSUE OF DROSOPHILA MELANOGASTER IMAGOES.

D. E. Philpott, J. Weibel, H. Atlan, and J. Miquel (NASA, Ames Research Center, Moffett Field, Calif.).

Journal of Invertebrate Pathology, vol. 14, July 1969, p. 31-38. 7 refs.

A viruslike particle has been found in the nucleus of fat-body cells and oenocytes of *Drosophila melanogaster* imagoes 15, 76, and 91 days old. The particle has also been observed in glial cells of the cephalic ganglionic center of 91-day-old flies and in glial cells of 29-day-old flies that were exposed to 50 kr of gamma radiation when they were one day old. (Author)

A69-42050

A REVIEW OF SYMPOSIUM ON GENETIC EFFECTS OF SPACE ENVIRONMENT.

Sohei Kondo (Osaka University, Dept. of Fundamental Radiology, Osaka, Japan).

(International Congress of Genetics, 12th, International Symposium on Genetic Effects of Space Environment, Tokyo, Japan, Aug. 25, 1968.)

Japanese Journal of Genetics, vol. 43, no. 6, 1968, p. 472-478. 28 refs.

Summary of the principal ideas included in the lectures of the International Symposium on Genetic Effects of Space Environment. The response of insect gametes to the conditions of space flight and to radiation under conditions of reduced gravity is outlined, along with the response of insects, plants, and microorganisms to the conditions of space flight with and without irradiation. It is concluded that when dominant lethality in sperm was the criterion no effects of space-flight conditions were observed. The same applies to the synergistic interaction of radiation effects and space flight on biological materials. The largest enhancing effects in insects involved the induction of translocation in spermatogonia, which was found with radiation as well as without radiation. Chromosome aberrations were rather insensitive to space-flight factors not only in human cells but also in higher plant cells. The results obtained strongly suggest that the genetic effects of space-flight factors occurred not only by direct action on chromosomes but also through indirect actions on other biological units. The space-flight effects attributable to disturbance in cell division are most noticeable in organisms with the largest nuclei. O.H.

A69-42051 #

LACK OF ADAPTATION AFTER AIRCRAFT-NOISE INDUCED STRESS AS A CRITERION OF HARMFULNESS (DER ADAPTATIONSRÜCKSTAND NACH FLUGLÄRMBELASTUNG ALS SCHÄDLICHKEITSKRITERIUM).

W. Lorenz (Halle, Universität, Klinik für Hals-Nasen-Ohrenkrankheiten, Halle, East Germany).

Verkehrsmedizin und ihre Grenzgebiete, vol. 16, June 1969, p. 236-242. 58 refs. In German.

Results of hearing adaptation measurements carried out after aircraft-noise stresses of 30-min duration in order to obtain a realistic estimation of possible noise damage induced by various aircraft. The results indicate that persons who had been exposed to the noise of small one-engined aircraft show a considerable lack of adaptation as compared with those subjected to the cockpit noise of four-engined turboprop aircraft. O.H.

A69-42052 #

ADAPTATION OF ELECTRICAL AUTOSTIMULATION IN THE HYPOTHALAMUS AND OF THE INSTRUMENTAL CONFIRMATIVE REACTION TO VARYING CONDITIONS OF RELEASE (ANPASSUNG DER ELEKTRISCHEN AUTOSTIMULATION IM HYPOTHALAMUS UND DER INSTRUMENTELLEN BEKRÄFTIGUNGSREAKTION AN SICH ÄNDERNDE AUSLÖSEBEDINGUNGEN).

E. Fuchs and W. Rüdiger (Berlin, Humboldt-Universität, Physiologisches Institut, Berlin, East Germany).

Acta Biologica et Medica Germanica, vol. 22, no. 1, 1969, p. 69-78. 21 refs. In German.

Study of the adaptability of electrical self-stimulation of the hypothalamus or of an instrumental self-reinforcing reaction in 20 rats, using a modified Skinner-box technique. The following variations of interference were performed: (1) changing the intensity of the hypothalamus stimulations in a step-like or in a smooth linear fashion during the performance of self-stimulation, and (2) changing the mechanical lever resistance during self-stimulation and self-reinforcement with a water reward. It is shown that there is a feedback regulation of the intensity of the lever activation and of the duration of this activation. The difference between the electrical self-stimulation and the self-reinforcement was found to be insignificant. Z.W.

A69-42053 #

RELEASE OF NORADRENALIN FROM THE DOG HEART AFTER A TEMPORARY OCCLUSION OF CORONARY ARTERY (NORADRENALINABGABE AUS DEM HUNDEHERZEN NACH VORÜBERGEHENDER OKKLUSION EINER KORONARARTERIE).

L. Shahab, A. Wollenberger, M. Haase, and U. Schiller (Deutsche Akademie der Wissenschaften, Institut für Kreislaufforschung and Arbeitsstelle für Herz- und Gefässchirurgie, Berlin, East Germany).

Acta Biologica et Medica Germanica, vol. 22, no. 1, 1969, p. 135-143. 23 refs. In German.

Study of the release of noradrenalin from the hearts of open-chest dogs given artificial respiration upon occlusion of the left descending coronary artery for 2.5 min with a clamp. Blood samples were taken continuously from the carotid artery and from the branch of the great cardiac vein running parallel to the occluded coronary artery. Analyses of blood sera indicated that noradrenalin and lactate were released from the temporarily ischemic heart region for periods up to 6 min after reopening the blood flow. The mobilization of endogenous noradrenalin in the ischemic myocardium is believed to assist the muscle in switching from respiratory to glycolic metabolism. Z.W.

A69-42054 #

A FLASH-STIMULATING APPARATUS FOR BIOLOGICAL STUDIES (EIN LICHTREIZGERÄT FÜR BIOLOGISCHE UNTERSUCHUNGEN).

H. Kaschowitz (Jena, Universität, Physiologisches Institut, Jena, East Germany).

Acta Biologica et Medica Germanica, vol. 22, no. 2, 1969, p. 411-415. In German.

Description of a flash-stimulating apparatus supplying single and rhythmic square light pulses and pulse pairs of 1.5- to 500-msec

duration in the frequency range from 1 to 300 Hz. The flash-dark ratio can be adjusted to 2:1. The apparatus is equipped with a gas-discharge lamp producing "white" and monochromatic light. The lamp control unit is stabilized by transistors connected in a new type of circuit. O.H.

A69-42055 #
EVALUATION OF MULTISENSORY SIGNAL-PROCESSING IN CORTICAL AND BRAIN STEM REGIONS OF THE ALBINO RAT (EVALUATION MULTISENSORISCHER SIGNALVERARBEITUNGSPROZESSE IN KORTIKALEN UND STAMMHIRNBEREICHEN DER ALBINO-RATTE).

F. Grieger and H. Baumann (Deutsche Akademie der Wissenschaften, Institut für Kortiko-viszerale Pathologie und Therapie, Berlin, East Germany).

Acta Biologica et Medica Germanica, vol. 22, no. 3-4, 1969, p. 589-609. 41 refs. In German.

Examination of albino rats for corticosubcortical response to unisensory and multisensory stimulation using electronic averaging and time histogram techniques. Combined optical and acoustic stimulation resulted in arithmetic addition of primary response components to either stimulus. This is considered to be an expression of independent signal-processing in all structures investigated (auditory and visual cortex, rhombomesencephalic formatio reticularis, hypothalamus). The intersensory action was characterized largely by latency differences and amplitude levels of auditory and visual evoked potentials. The response to an auditory stimulus was always of shorter latency than the flash response. G.R.

A69-42056 #
ELECTRONIC TENSILE STRESS METER (ELEKTRONISCHER ZUGSPANNUNGSMESSER).

E. Schmid and H. G. Lippmann (Institut für Diabetes, Karlsburg, East Germany).

Acta Biologica et Medica Germanica, vol. 22, no. 3-4, 1969, p. 665-667. 5 refs. In German.
Research supported by the Ministerium für Gesundheitswesen.

Discussion of a device for isometric recording of tensile stresses on muscle preparations in vitro. The principle of operation of the device is based on the differential transformer. The mechanical design is described, and a diagram of the electronic circuit is provided. G.R.

A69-42057 #
SELF-RHYTHMS OF MOTOR NERVE FIBERS STIMULATED BY MIDDLE-FREQUENCY ELECTRICAL PULSES (ÜBER EIGENRHYTHMEN DER MOTORISCHEN NERVENFASER BEI REIZUNG MIT MITTELFREQUENTEN ELEKTRISCHEN IMPULSEN).

F. Schwarz (Jena, Universität, Physiologisches Institut, Jena, East Germany).

Acta Biologica et Medica Germanica, vol. 22, no. 5-6, 1969, p. 747-750. In German.

Investigation of self-rhythms of about 200 to 420 Hz produced in motor nerves under the influence of electric pulses in a frequency range from 2 to 6.4 kHz. The observed self-rhythms are presumed to be related to changes in the viscosity of the nerve substance and to alternations in the activity of the sodium carrier system and the sodium pump. P.G.

A69-42058 #
EQUIPMENT FOR MEASURING REST POTENTIALS ON ISOLATED FROG SKELETAL MUSCLE FIBERS BY MEANS OF GLASS MICROELECTRODES (EINRICHTUNG ZUR MESSUNG VON RUHEPOTENTIALEN MITTELS GLAS-MIKROELEKTRODEN AN ISOLIERTEN FROSCH-SKELETTMUSKELFASERN).

Th. Schuster (Berlin, Humboldt-Universität, Sektion Biologie, Berlin, East Germany).

Acta Biologica et Medica Germanica, vol. 22, no. 5-6, 1969, p. 811-813. In German.

Description of a device designed for measuring electrical potentials on isolated muscle fibers mounted on a micromanipulator. The apparatus is equipped with a facility for circulating various liquids around the fiber, which is fixed in a channel by means of two microforceps. An arrangement for transferring the fiber from the dissecting basin into the channel is also described. P.G.

A69-42060
SPECIFIC INHIBITION OF THE RELAXATION PROCESS IN THE MAMMALIAN MYOCARDIUM AT VERY LOW TEMPERATURES (1 TO 10°C) (SPEZIFISCHE HEMMUNG DES ERSCHLAFFUNGSPROZESSES AM STARK GEKÜHLTEN WARMBLÜTERMYOKARD /1°C-10°C/).

R. Kaufmann, H. Homburger, and H. Tritthart (Freiburg, Universität, Physiologisches Institut, Freiburg im Breisgau, West Germany).

(Deutsche Physiologische Gesellschaft, Frühjahrstagung, Bad Nauheim, West Germany, Apr. 28-30, 1965.)
Pflügers Archiv, vol. 305, no. 1, 1969, p. 1-8. 15 refs. In German.
Research supported by the Deutsche Forschungsgemeinschaft.

Investigation of the temperature dependence of the action potential, the isometric tension development, and the relaxation rate of the mammalian myocardium in the temperature range from 0 to 10 deg C. It is found that below 8 deg C the relaxation process of the mammalian myocardium is particularly slow. It is concluded that in a calcium-rich medium at low temperature the calcium-binding capacity of the vesicular components of the sarcoplasmatic reticulum becomes insufficient, owing to an enhancement of the passive influx or liberation of free Ca ions and an inhibition of the active reabsorption of Ca ions into the vesicles by means of an ATP-driven Ca pump. P.G.

A69-42061
CORONARY PERFUSION PRESSURE AND LEFT VENTRICULAR FUNCTION.

Jan E. W. Beneken, Arthur C. Guyton, and Kiichi Sagawa (Mississippi, University, Dept. of Physiology and Biophysics, Jackson, Miss.).

Pflügers Archiv, vol. 305, no. 1, 1969, p. 76-95. 15 refs.
Research supported by the American Heart Association.

Description of a stable preparation in which the left ventricle is functionally isolated from the rest of the circulation in dogs. Mean aortic pressure (MAP) and mean left arterial pressure (MLAP) can be varied independently, while aortic flow (AF) is measured as a dependent variable. Experimental studies showed that when MLAP was kept constant and MAP was varied, a definite maximum of AF was obtained at an MAP that varied widely from animal to animal between 36 and 98 mm Hg. The value of MAP where the maximum AF was found increased by an average of 10 mm Hg for each increase in maximum AF of 1 liter/min. A distinction is made between myocardial oxygen consumption and oxygen supply, and equations are derived that relate these quantities with MAP, AF, heart rate, and hematocrit. It is suggested that the optimum MAP is closely associated with the lower limit of the autoregulation range of coronary flow. P.G.

A69-42062
THE INFLUENCE OF THE AMPLITUDE, FREQUENCY AND MEAN VALUE OF A SINUSOIDAL PRESSURE STIMULUS AT THE BARORECEPTORS ON MEAN ARTERIAL BLOOD PRESSURE IN DOGS (DER EINFLUSS VON AMPLITUDE, FREQUENZ

UND MITTELWERT SINUSFÖRMIGER REIZDRUCKE AN DEN PRESSORECEPTOREN AUF DEN ARTERIELLEN MITTELDRUCK DES HUNDES).

Jürgen Stegemann (Köln, Deutsche Sporthochschule, Physiologisches Institut, Cologne, West Germany) and Ulrich Tibes (Köln, Universität, Institut für Normale und Pathologische Physiologie, Cologne, West Germany).

Pflügers Archiv, vol. 305, no. 3, 1969, p. 219-228. 13 refs. In German.

Research supported by the Deutsche Forschungsgemeinschaft.

Investigation of the effects of sinusoidal pressure stimuli in the isolated carotid sinus on peripheral blood pressure in dogs. The remaining baroreceptor areas were denervated. Amplitude, frequency, and mean pressure of the stimulus were varied independently. In the lower range of mean carotid sinus pressure, a decrease of mean peripheral pressure as a function of frequency was observed. The blood pressure decreased up to 2 cps and remained constant when the frequency was increased up to 8 cps. This frequency effect was augmented by an increased stimulation amplitude. Dynamic characteristics were calculated from the data. As a reason for the measured effects, the influence of two rectifiers in the neural transmission is discussed. G.R.

A69-42063

GASTRIC MOTILITY AND pH DURING NATURAL HUMAN SLEEP (DAS VERHALTEN VON pH UND MOTILITÄT DES MAGENS IM NATÜRLICHEN SCHLAF DES MENSCHEN).

W. Baust and W. Rohrwasser (Düsseldorf, Universität, Neurologische Klinik, Düsseldorf, West Germany).

Pflügers Archiv, vol. 305, no. 3, 1969, p. 229-240. 22 refs. In German.

Research supported by the Deutsche Forschungsgemeinschaft.

Study of the EEG, ocular movements, gastric motility, and pH during the sleep of eight healthy persons. The data from the stomach were transmitted by a small radio transmitter swallowed by the subjects at the beginning of the experiment. Strong gastric motility was observed in all subjects during the fourth hour of sleep. It continued to increase during the second half of the night. No characteristic changes in gastric acidity could be detected during the course of the night. In all subjects, the pH varied between 0 and 3. Gastric motility decreased significantly with the depth of sleep, while it was markedly enhanced during rapid-eye-movement sleep. G.R.

A69-42064

MEASUREMENTS OF FACILITATED DIFFUSION OF OXYGEN IN RED BLOOD CELLS AT 37°C.

W. Moll (Hannover, Medizinische Hochschule, Institut für Physiologie, Hanover, West Germany).

Pflügers Archiv, vol. 305, no. 3, 1969, p. 269-278. 20 refs. Translation.

Research supported by the Deutsche Forschungsgemeinschaft.

Study of the steady-state transfer of oxygen across thin layers of centrifuged red cells at 37 deg C, before and after saturation of the hemoglobin with CO. The measurements were taken at 107 torr and 116 torr average oxygen partial pressure difference, respectively. Before CO saturation, the oxygen transfer was 64 per cent higher than afterwards. The average difference of the oxygen saturation at both surfaces of the erythrocyte layer was 82 per cent. The maximum oxygen diffusion facilitated by oxyhemoglobin diffusion was calculated to be equal to the free diffusion which occurs at 100 torr partial pressure difference. G.R.

A69-42065

ENERGY COST OF ISOTONIC TETANIC CONTRACTIONS OF VARIED FORCE AND DURATION IN MAMMALIAN SKELETAL MUSCLE.

P. E. di Prampero, P. Cerretelli, and J. Piiper (Max-Planck-Institute for Experimental Medicine, Dept. of Physiology, Göttingen, West Germany; Milan, University, Dept. of Physiology, Milan, Italy).

Pflügers Archiv, vol. 305, no. 3, 1969, p. 279-291. 18 refs.

Research supported by the Consiglio Nazionale delle Ricerche.

Study of the energy cost of muscular exercise in the gastrocnemius muscle of dogs anesthetized with morphine, chloralose, and urethane. The muscle, loaded with 2 to 8 kg, was stimulated supramaximally to rhythmic isotonic contractions, the duration of which was varied from 0.2 to 1.2 sec. The energy expenditure was obtained from the oxygen uptake and the lactic acid output, calculated from venous outflow and arterio-venous differences. Within certain limits, the oxygen uptake seemed to increase with blood flow, although the performance remained about constant. This was further shown by decreasing mechanical efficiency with increasing flow, and by increasing oxygen consumption for the maintenance of a tetanic contraction with increasing flow. G.R.

A69-42066

INFLUENCE OF TEMPERATURE ON THE AFFERENT AND EFFERENT MOTOR INNERVATION OF THE SPINAL CORD. I—TEMPERATURE DEPENDENCE OF AFFERENT AND EFFERENT SPONTANEOUS ACTIVITY (DER EINFLUSS DER TEMPERATUR AUF DIE AFFERENTE UND EFFERENTE MOTORISCHE INNERVATION DES RÜCKENMARKS. I—TEMPERATURABHÄNGIGKEIT DER AFFERENTEN UND EFFERENTEN SPONTANTÄTIGKEIT).

F. W. Klussmann (Max-Planck-Gesellschaft zur Förderung der Wissenschaften, William G. Kerckhoff-Herzforschungsinstitut, Bad Nauheim, West Germany).

Pflügers Archiv, vol. 305, no. 4, 1969, p. 295-315. 50 refs. In German.

Study of the influence of spinal-cord temperature on the spontaneous afferent and efferent activity of the spinal cord, using filament recordings from ventral and dorsal roots in 23 anesthetized cats. It is concluded that the thermal sensitivity of mammalian spinal motoneurons depends on their size or some factor correlated with size; the smaller the neuron the easier it can be activated and inactivated by a fall in spinal temperature. Bigger cells like alpha-motoneurons are activated and inactivated at relatively low spinal temperatures. Z.W.

A69-42067

INFLUENCE OF TEMPERATURE ON THE AFFERENT AND EFFERENT MOTOR INNERVATION OF THE SPINAL CORD. II—TEMPERATURE DEPENDENCE OF MUSCLE SPINDLE FUNCTION (DER EINFLUSS DER TEMPERATUR AUF DIE AFFERENTE UND EFFERENTE MOTORISCHE INNERVATION DES RÜCKENMARKS. II—TEMPERATURABHÄNGIGKEIT DER MUSKELSPINDELFUNKTION).

F. W. Klussmann and H.-D. Henatsch (Max-Planck-Gesellschaft zur Förderung der Wissenschaften, William G. Kerckhoff-Herzforschungsinstitut, Bad Nauheim; Göttingen, Universität, Physiologisches Institut, Göttingen, West Germany).

Pflügers Archiv, vol. 305, no. 4, 1969, p. 316-339. 57 refs. In German.

Study of the influence of spinal-cord temperature on the stretch responses of primary and secondary muscle spindle endings of tricepts surae, anterior tibialis, and extensor digitorum longus in 27 anesthetized cats. It is found that during the early phase of isolated spinal cooling, the spontaneous activity, the acceleration response, and the dynamic response of primary afferents increased while the static response remained unchanged. With further cooling and with the appearance of shivering, the spontaneous activity, the acceleration responses, and the dynamic responses of primary endings dropped to lower values than at normal temperatures, but not so the static responses. These findings suggest a parallel activation followed by an inactivation of both the dynamic gamma-trail fibers and the

static gamma-plate fibers to muscle spindles. The decrease in spontaneous activity seemed to be more pronounced in extensor muscles than in flexor muscles. With secondary endings, all changes were much less than with primary endings. Z.W.

A69-42068
VENOMOTOR REACTIONS INDUCED BY CHANGES OF INTRAPULMONARY PRESSURE DURING POSITIVE AND NEGATIVE PRESSURE BREATHING (VENOMOTORISCHE REAKTIONEN BEI VERÄNDERUNGEN DES INTRAPULMONALEN DRUCKES DURCH ÜBER- UND UNTERDRUCKATMUNG).

A. Mowassaghi, K. W. Westermann, and E. Witzleb (Münster, Universität, Gollwitzer-Meier-Institut, Physiologische Abteilung, Bad Oeynhausen; Münster, Universität, Physiologisches Institut, Münster, West Germany).

Pflügers Archiv, vol. 305, no. 4, 1969, p. 340-350. 17 refs. In German.

Investigation of the effects of positive- and negative-pressure breathing on the tonus of the capacity vessels of the skin of the forearm, during spontaneous respiration and during respiration when the tidal volume was doubled and the respiratory rate halved. In some cases, the cutaneous blood flow of a finger was measured simultaneously. The results obtained are discussed (1) with regard to the transmural pressure as a specific stimulus to the excitation of intrathoracic receptors and (2) with respect to their importance in provoking reflex venomotor reactions by positive and negative pressure breathing. Z.W.

A69-42069
DEPENDENCE OF THE SPONTANEOUS RHYTHM AND CONTRACTILE TONUS OF AN ISOLATED RAT AORTA ON EXTRACELLULAR CONCENTRATION OF NORADRENALIN, K^+, AND Ca^{++} (SPONTANRHYTHMIK UND CONTRACTILER TONUS DER ISOLIERTEN RATTENAORTA IN ABHÄNGIGKEIT VON DER EXTRACELLULÄREN NORADRENALIN-, K^+- UND Ca^{++}-KONZENTRATION).

G. Biamino and H. L. Thron (Berlin, Freie Universität, Physiologisches Institut, Berlin, West Germany).

Pflügers Archiv, vol. 305, no. 4, 1969, p. 361-381. 60 refs. In German.
Research supported by the Deutsche Forschungsgemeinschaft; Contract No. AF 61(052)-947.

Study of the relation between the manifestation and the pattern of spontaneous rhythmical activity and mean vascular tone in isolated helical strips of rat aorta. Noradrenalin and/or the external concentrations of single-charge positive K ions and double-charge positive Ca ions were changed in the bathing solution. It is concluded that at least in the helical strip of rat aorta, the vascular tone is brought about by summation of spontaneous rhythmical contractions, more or less synchronized by cell-to-cell conduction. Although there was evidence of "delayed relaxation" in the aortic strip, the existence of tonic mechanisms separable from phase activity could not be confirmed. Z.W.

A69-42070
CIRCADIAN RHYTHM IN MAN UNDER THE EFFECT OF LIGHT-DARK CYCLES OF DIFFERENT PERIODS (CIRCADIANE PERIODIK DES MENSCHEN UNTER DEM EINFLUSS VON LICHT-DUNKEL-WECHSELN UNTERSCHIEDLICHER PERIODE).

J. Aschoff, E. Pöppel, and R. Wever (Max-Planck-Institut für Verhaltensphysiologie, Seewiesen and Erling-Andechs, West Germany).

Pflügers Archiv, vol. 306, no. 1, 1969, p. 58-70. 22 refs. In German.

Study of the circadian rhythms of ten subjects for different artificial light-dark cycles including twilight transitions. The zeitgeber was changed to periods either longer or shorter than 24 hr. It is shown that an artificial light-dark cycle synchronizes circadian rhythms in man only to periods which are close to 24 hr. For the activity rhythm, this range of entrainment is larger than for the temperature rhythm. The results establish the endogeneous character of human circadian rhythms using means other than the demonstration of free-running rhythms after the exclusion of zeitgebers. The finding that the rhythms of activity and of rectal temperature can vary independently, suggests that the two rhythms have to be considered as separate oscillators. Z.W.

A69-42071
AUTONOMOUS CIRCADIAN RHYTHM IN MAN UNDER THE EFFECT OF DIFFERENT ILLUMINATION CONDITIONS (AUTONOME CIRCADIANE PERIODIK DES MENSCHEN UNTER DEM EINFLUSS VERSCHIEDENER BELEUCHTUNGS-BEDINGUNGEN).

Rütger Wever (Max-Planck-Institut für Verhaltensphysiologie, Seewiesen and Erling-Andechs, West Germany).

Pflügers Archiv, vol. 306, no. 1, 1969, p. 71-91. 28 refs. In German.

Study of the autonomous circadian rhythm by testing 75 human subjects in complete isolation. Fifty-two subjects lived under constant illumination (also while sleeping), and 20 subjects switched on the light while getting up, and switched it off while going to bed (illumination by choice). With three subjects, the illumination was changed between the two kinds mentioned before. The intensity of illumination was varied during the experiment for 38 subjects to examine the influence of light intensity on the circadian period. It is found that under illumination by choice (1) the period is longer, (2) the standard deviation around the mean value of the period is greater, and (3) the tendency for internal desynchronization is greater than under constant illumination. A hypothesis explaining the results obtained is presented. Z.W.

A69-42072
DIURNAL RHYTHMS OF ORTHOSTATIC CARDIOVASCULAR RESPONSES (TAGESPERIODIK DER ORTHOSTATISCHEN KREISLAUFREAKTION).

Jürgen Aschoff (Deutsche Luftwaffe, Flugmedizinisches Institut, Fürstenfeldbruck, West Germany) and Jürgen Aschoff (Max-Planck-Institut für Verhaltenphysiologie, Seewiesen and Erling-Andechs, West Germany).

Pflügers Archiv, vol. 306, no. 2, 1969, p. 146-152. 16 refs. In German.

Experimental study of the reactions of heart rate and blood pressure to changes in posture on the tilt table. Measurements were taken every third hour throughout 24 hours for eight subjects. By computing the orthostatic index of Burkhart (1966), a diurnal rhythm of tilt table tolerance has been demonstrated. Two maxima of orthostatic lability have been found, a minor one toward noon and a major one at about 3 a.m. The rhythm of orthostatic lability seems to be independent of food intake. Consequences of these results with regard to test situations in space-flight medical investigations are briefly discussed. P.G.

A69-42073
STUDIES ON THE FUNCTIONAL SIGNIFICANCE OF EFFERENT INNERVATION IN THE AUDITORY SYSTEM—AFFERENT NEURONAL ACTIVITY AS INFLUENCED BY CONTRALATERALLY APPLIED SOUND.

R. Klinke, G. Boerger, and J. Gruber (Berlin, Freie Universität, Physiologisches Institut; Heinrich-Hertz-Institut, Berlin, West Germany).

Pflügers Archiv, vol. 306, no. 2, 1969, p. 165-175. 33 refs.
Research supported by the Deutsche Forschungsgemeinschaft.

Investigation of the efferent influence of one ear on the other. Recordings were made (using stereotaxic techniques) from single neurons of the cochlear nucleus of cats in very light barbiturate

anesthesia. The responses of afferent neurons to ipsilateral acoustic stimulation were recorded and compared with the responses following binaural stimulation. It was found that contralateral stimulation reduced the response of an afferent neuron to ipsilateral stimulation and that this inhibition is frequency-dependent. This effect is explained as resulting from efferent innervation. P.G.

A69-42074
THE INFLUENCE OF PORTAL BLOOD PRESSURE ON DIURESIS IN UNANESTHETIZED RATS (ÜBER DEN EINFLUSS DES DRUCKES IM PORTALKREISLAUF AUF DIE DIURESE DER WACHEN RATTE).
W. Ohm and F. J. Haberich (Berlin, Freie Universität, Physiologisches Institut, Berlin, West Germany).
Pflügers Archiv, vol. 306, no. 3, 1969, p. 227-231. 9 refs. In German.
Contract No. AF 61(052)-947.

Study of the effects of a pressure decrease in the portal blood circulation on diuresis with particular regard to osmotic diuresis. In unanesthetized rats the portal blood pressure was varied, and the diuresis was simultaneously recorded. A short-term increase in pressure lasting about 20 to 30 sec causes anuria during the time of the increase. Pressure increases lasting a longer time lead to an additional antidiuresis lasting about 30 to 40 min. Under conditions of osmotic diuresis only the anuric phase can be observed. Lowering of portal pressure is accompanied by an increase in urine flow in the case of both water or osmotic diuresis. The existence of stretch receptors in the portal circulation, whose activity can affect either renal blood flow or the release of antidiuretic hormone, is discussed. P.G.

A69-42075
DIURESIS DURING TOTAL IMMERSION IN A THERMALLY NEUTRAL BATH (DIE DIURESE BEI IMMERSION IN EIN THERMOINDIFFERENTES VOLLBAD).
D. Kaiser, P. Eckert, O. H. Gauer, and H. J. Linkenbach (Berlin, Freie Universität, Physiologisches Institut, Berlin, West Germany).
Pflügers Archiv, vol. 306, no. 3, 1969, p. 247-261. 28 refs. In German.
Research supported by the Deutsche Forschungsgemeinschaft; Contract No. AF 61(052)-947.

Experimental investigation of the causes of diuresis accompanying complete immersion in water of 34.0 to 34.5 deg C. The increase in urine flow during this immersion is interpreted as water diuresis reflexly caused by an expansion of intrathoracic blood volume and mediated through a rediction of blood antidiuretic hormone. If the control urine flow is increased to a water diuresis of 4 ml/min, water immersion remains without effect. A concomitant increase in osmotic clearance is interpreted as a washout effect. The observed increase in sodium excretion of about 27 per cent can only partly be explained by a slight increase in the filtration rate (amounting to 11 per cent) and is assumed to be due to a reduction in tubular sodium reabsorption. P.G.

A69-42076
DEPENDENCE OF dv/dt AND dp/dt OF VENTRICULAR PRESSURE OF THE HEART ON PHYSICAL SYSTOLIC RESULTS (DIE ABHÄNGIGKEIT VON dv/dt UND dp/dt DES VENTRIKELDRUCKES DES HERZENS VON PHYSIKALISCHEN RESULTATEN DER SYSTOLE).
M. Kohlhardt, K. Wirth, and J. Dudeck (Mainz, Universität, II. Medizinische Klinik und Poliklinik, Mainz, West Germany).
(Deutsche Physiologische Gesellschaft, Frühjahrstagung, 34th, Mainz, West Germany, Mar. 27-29, 1968.)
Pflügers Archiv, vol. 306, no. 4, 1969, p. 290-303. 22 refs. In German.

Evaluation of experiments performed on isolated cat hearts in order to examine correlations between the differential quotients of pressure/time or stroke volume/time curves and some characteristics of the mechanical performance of the left heart ventricle. By metabolic alcalosis, pressure load, and increased preload, the dynamics of ventricular contraction and its physical results were varied. From the results obtained it is concluded that there exists a proportionality between the differential quotient of the volume curve (as the most important derivation of the ventricular pressure curve) and the physical results of ventricular contraction. P.G.

A69-42077
EXCITATION OF ELLIPSE PHENOMENA BY SINUSOIDAL STIMULATING CURRENTS OF 162 TO 208 Hz AND 287 TO 324 Hz (ANREGUNG DES ELLIPSENPHÄNOMENS DURCH SINUSFÖRMIGE REIZSTRÖME VON 162-208 Hz UND 287-324 Hz).
E. Welpe (München, Technische Hochschule, Institut für technische Elektronik, Munich, West Germany).
Pflügers Archiv, vol. 306, no. 4, 1969, p. 304-319. 18 refs. In German.

Investigation of optical phenomena perceptible as dark elliptic rings or other patterns when the eye is stimulated periodically and is simultaneously viewing a bright area. In the experiments performed, the ellipse phenomenon (EP) was found to be excited at frequency ranges from 81 to 104 Hz (EP 1), from 162 to 208 Hz (EP 2), and from 287 to 324 Hz (EP 3). While the EP 2 differed often from the ideal shape of the ellipse as perceived at EP 1, the EP 3 did so always. An ellipse was distinguishable mostly, however, as the basic shape of the EP 2 as well as of EP 3. The frequency dependence of the major and minor axes of EP 1 and EP 2 was measured. P.G.

A69-42078
RHEOLOGICAL CONSEQUENCES OF OSMOTIC RED CELL CRENATION.
Holger Schmid-Schönbein and Roe Wells (Munich, University, Dept. of Physiology, Munich, West Germany; Peter Bent Brigham Hospital and Harvard University, Harvard Medical School, Dept. of Medicine, Boston, Mass.).
Pflügers Archiv, vol. 307, no. 1, 1969, p. 59-69. 20 refs.

Measurement of the viscosity of normal blood and of packed cell suspensions over a wide range of shear rates. It is noted that the rise in blood viscosity at very low shear rates is based upon the formation of a three-dimensional cell structure build-up by red cell rouleaux. Osmotic red cell crenation abolishes rouleaux formation and the secondary formation of larger red cell aggregates, so that in suspension of crenated red cells in plasma the viscosity at low shear rates is reduced. It is shown that at high shear rates the viscosity is increased, due to a reduced viscous deformability of osmotically shrunken red cells. It is suggested that the anomalous viscosity of blood is determined by at least two factors—namely, red cell aggregation and red cell deformation. P.G.

A69-42079
A STUDY OF TEMPERATURE REGULATION IN THE HUMAN BODY WITH THE AID OF AN ANALOGUE COMPUTER.
A. R. Atkins (Chamber of Mines of South Africa, Physical Sciences Laboratory, Johannesburg, Republic of South Africa) and C. H. Wyndham (Chamber of Mines of South Africa, Human Sciences Laboratory, Johannesburg, Republic of South Africa).
Pflügers Archiv, vol. 307, no. 2, 1969, p. 104-119. 13 refs.

Study of the human thermoregulatory mechanism by means of an analog computer, which is used as a model to reproduce man's thermal behavior. A number of tests were made to study some thermal control characteristics, and the results are compared with those of a series of experiments performed om two resting subjects who were exposed to various environmental conditions in a climatic chamber. O.H.

A69-42080
TWO COMPONENTS OF INWARD CURRENT IN MYOCARDIAL MUSCLE FIBERS.
D. Mascher and K. Peper (Heidelberg, Universität, II. Physiologisches Institut, Heidelberg, West Germany).
Pflügers Archiv, vol. 307, no. 3, 1969, p. 190-203. 24 refs.
Research supported by the Deutsche Forschungsgemeinschaft.

Discussion of voltage clamp experiments on ventricular muscle in which a long lasting transient inward current was found. The membrane potential of trabeculae of the sheep ventricle was clamped. In response to a depolarizing step a transient inward current lasting 100 msec was elicited. This transient current could be separated into a rapid component which was strongly dependent on the holding potential prior to depolarization and a slower component which could not be inactivated by a variation in the holding potential and which could also be observed in sodium-free solutions. G.R.

A69-42081
IMPROVEMENT OF BODY PLETHYSMOGRAPHIC MEASUREMENTS BY MEANS OF AN ANALOG COMPUTER (VERBESSERUNG GANZKÖRPERPLETHYSMOGRAPHISCHER UNTERSUCHUNGEN DURCH EINSATZ EINES ANALOGRECHNERS).
K. Muysers (Bonn, Universität, Physiologisches Institut, Bonn, West Germany), U. Smidt (Krankenhaus Bethanien, Moers, West Germany), and F. W. Buchheim (Siemens AG, Entwicklungslabor, Erlangen, West Germany).
Pflügers Archiv, vol. 307, no. 3, 1969, p. 211-219. 27 refs. In German.
Research supported by the Europäische Gemeinschaft für Kohle und Stahl.

Discussion of a method of avoiding the disturbing influence on the body plethysmographic chamber signal caused by the difference in temperature and humidity between inspired and expired air. A small analog computer is employed to correct the chamber signal during spontaneous breathing of nonhumidified or warmed air. Mathematical relations for the correction are discussed. It is assumed that the partial pressure of vapor in the expired air and the temperature of the expired air are constant. The correctness of these assumptions was experimentally verified. G.R.

A69-42083
CHANGES OF HEART RATE DURING DIVING AND BREATH-HOLD AFTER EXERCISE (DIE VERÄNDERUNG DER HERZFREQUENZ BEIM TAUCHEN UND ATEMANHALTEN NACH KÖRPERLICHER ANSTRENGUNG).
Jürgen Stegemann and Ulrich Tibes (Köln, Deutsche Sporthochschule, Physiologisches Institut, Cologne, West Germany).
Pflügers Archiv, vol. 308, no. 1, 1969, p. 16-24. 20 refs. In German.

Investigation of the influence of diving and breath-hold following different levels of exercise on the changes of heart rate in male humans. The subjects had to swim against variable forces, until their heart rate had reached mean values of 80, 100, 120, and 140 beats per min. From 5 to 10 sec after diving had started, the heart rate began to decrease and reached values of 50 to 60 per min, which were independent of the starting level. The corresponding values recorded during breath-hold in water without diving were found to be about 20 per cent higher. About 20 sec after the end of diving or breath-hold the heart rate was 10 to 20 per cent lower than the starting level. It is suggested that the effect is due to an isolated augmentation of the vagal tonus of the heart which is elicited from stretch receptors of the right heart and the pulmonary trunk. The threshold of these receptors seems to be exceeded by the combined pressure effects of immersion and inspiration on the central blood volume. The "diving reflex" in man generally seems to be an effect of a general augmentation of sympathetic tonus caused by the preliminary exercise or oxygen lack combined with an isolated increase in the heart vagal tonus. G.R.

A69-42084
THE EFFECT OF TRAINING IN SWIMMING AND RUNNING ON THE CELLULAR FUNCTION AND STRUCTURE OF MUSCLE (DIE WIRKUNG VON SCHWIMM- UND LAUFTRAINING AUF DIE CELLULÄRE FUNKTION UND STRUKTUR DES MUSKELS).
H. Kraus, R. Kirsten, and Joachim R. Wolff (Berlin, Freie Universität, Berlin, West Germany).
Pflügers Archiv, vol. 308, no. 1, 1969, p. 57-79. 37 refs. In German.

Study of the capacity of the mitochondrial fraction from hind limb muscles to oxidize pyruvate triples in rats subjected to a strenuous program of swimming or treadmill running. Concomitantly, the concentrations of cytochromes and the activities of structural bound mitochondrial enzymes (glycerol-l-phosphate-oxidase, succinic dehydrogenase) per gram of muscle increase approximately twofold in response to the training. There is also a significant rise in mitochondrial protein content. Electron micrographs of exercised muscles show a marked hypertrophy and an increase in the number of mitochondria. These findings suggest that the rise in respiratory enzyme activity is due to *de novo* synthesis of enzyme protein. Phosphorylation is not uncoupled from respiration at any stage of the exercise, indicating that the increase in mitochondrial electron transport capacity is associated with a rise in the capacity to produce ATP. Under the investigated conditions anaerobic muscle metabolism remains unchanged. Only a glycogen increase of approximately 50 per cent is noted after five weeks of swimming exercise. G.R.

A69-42086
INTERPRETATION OF THE CHARACTER OF THE O_2-DISSOCIATION CURVE. I—THE EFFECT OF THE SOLUBILITY COEFFICIENT ON THE PLOT OF THE O_2-DISSOCIATION CURVE (ZUR INTERPRETATION DES O_2-BINDUNGSKURVENVERLAUFES. I—DER EINFLUSS DES LÖSLICHKEITSKOEFFIZIENTEN AUF DIE DARSTELLUNG DER O_2-BINDUNGSKURVE).
Rolf Zander (Mainz, Universität, Physiologisches Institut, Mainz, West Germany).
Pflügers Archiv, vol. 308, no. 2, 1969, p. 127-136. 18 refs. In German.

A69-42087
CHANGE OF HUMAN PLASMA VOLUME DURING IMMERSION IN A THERMALLY NEUTRAL WATER BATH (ÄNDERUNG DES PLASMAVOLUMENS DES MENSCHEN BEI IMMERSION IN EIN THERMOINDIFFERENTES WASSERBAD).
D. Kaiser, H. J. Linkenbach, and O. H. Gauer (Berlin, Freie Universität, Physiologisches Institut, Berlin, West Germany).
Pflügers Archiv, vol. 308, no. 2, 1969, p. 166-173. 11 refs. In German.
Research supported by the Deutsche Forschungsgemeinschaft; Contract No. AF 61(052)-68-C-0069.

Investigation of urine flow, change in weight, plasma volume (Evan's Blue), and hematocrit in 24 subjects before and after immersion up to the chin in a thermally neutral bath for 8 hr. It is found that the diuresis of immersion is accompanied by a weight loss of approximately 1.2 kg and a reduction of plasma volume of about 500 ml (14 per cent). The results show considerable scatter and do not allow a precise correlation between weight loss and the mean reduction of plasma volume. The diuresis following expansion of the intrathoracic blood volume is interpreted as an expression of a control mechanism arising in the atrial receptor zones for the reflex regulation of the total blood volume. Orthostatic weakness at the end of the immersion was observed. It is considered as a natural correlate of the reduction of blood volume. P.G.

A69-42088
CORONARY CIRCULATION RESPONSE TO HYPEROXIA AFTER VAGOTOMY AND COMBINED ALPHA AND BETA

ADRENERGIC RECEPTORS BLOCKADE IN THE ANESTHETIZED INTACT DOG.

J. Lammerant, C. De Schryver, I. Becsei, M. Camphyn, and J. Mertens-Strijthagen (Facultés Universitaires Notre-Dame de la Paix, Département de Physiologie, Namur, Belgium).

Pflügers Archiv, vol. 308, no. 3, 1969, p. 185-196. 24 refs.
Research supported by the Fonds National de la Recherche Scientifique of Belgium.

Study of blood oxygen tension, coronary blood flow, coronary resistance, and myocardial oxygen consumption in closed-chest vagotomized dogs with alpha and beta adrenergic receptors blockade. Results show that autonomic influences normally play a dominant role in the hyperoxia-induced reduction in cardiac work and metabolism. O.H.

A69-42089

"DEMULTIPLICATED" NEURONAL DISCHARGE PERIODICITIES CORRELATED WITH STIMULUS FREQUENCY IN COLLICULUS INFERIOR AND GENICULATUM MEDIALE (REIZFREQUENZKORRELIERTE "UNTERSETZTE" NEURONALE ENTLADUNGSPERIODIZITÄT IM COLLICULUS INFERIOR UND IM CORPUS GENICULATUM MEDIALE).

E. David, P. Finkenzeller, S. Kallert, and W. D. Keidel (Erlangen-Nürnberg, Universität, I. Physiologisches Institut, Erlangen, West Germany).

Pflügers Archiv, vol. 309, no. 1, 1969, p. 11-20. 31 refs. In German.

Confirmation of the stimulus correlated discharge periodicities of single neurons for the *colliculus inferior*. These discharge periodicities were described in the literature for all parts of the acoustic channel below the *geniculatum mediale*. A quite different kind of discharge periodicity in the *geniculatum mediale* is also reported. From these results, structure models are derived for the neuronal temporal measurement of coincidence. A possibility of discrimination between intramodality-specific and intramodality-nonspecific processing mechanisms is shown. P.G.

A69-42090

VENOUS TONE AND SKIN AND MUSCLE BLOOD FLOW IN FOREARM AND HAND DURING EXERCISE (VENENTONUS, HAUT- UND MUSKELDURCHBLUTUNG AN UNTERARM UND HAND BEI BEINARBEIT).

D. Hanke, M. Schlepper, K. Westermann, and E. Witzleb (Münster, Universität, Gollwitzer-Maier-Institut, Physiologische Abteilung, Bad Oeynhausen, West Germany).

Pflügers Archiv, vol. 309, no. 2, 1969, p. 115-127. 21 refs. In German.

Study of alterations of venous tone in superficial forearm veins, as well as alterations of peripheral venous pressure, skin blood flow, and muscle blood flow in the contralateral forearm and alterations of heart rate and respiration in healthy subjects during leg exercise in the supine position on a bicycle ergometer. An increase in venous tone was observed after the beginning of exercise, which reduced to resting values in the case of a light work load. In the case of moderate and severe work load venous tone remained increased until the end of exercise and often fell below the resting value in the recovery period. Peripheral venous pressure showed augmentations proportional to work load. At the beginning of exercise skin blood flow decreased and showed mirror-image reactions to alternations in venous tone. Muscle blood flow first increased and in the course of moderate to severe work load decreased. It is shown that circulatory and thermoregulatory adjustments, as well as emotional factors, influence the reactions and that the neurally effected venomotor reactions are significant, especially for the adaptation of vessel capacity. P.G.

A69-42091

CHARACTERISTIC CURVES OF THE SENSITIVITIES OF PRIMARY MUSCLE SPINDLE ENDINGS DURING COLD SHIVERING (KENNLINIEN DER MESSEMPFINDLICHKEITEN PRIMÄRER MUSKELSPINDELAFFERENZEN BEIM KÄLTEZITTERN).

S.-S. Schäfer (Göttingen, Universität, Physiologisches Institut, Göttingen, West Germany).

Pflügers Archiv, vol. 309, no. 2, 1969, p. 128-144. 23 refs. In German.
Research supported by the Deutsche Forschungsgemeinschaft.

Investigation of primary muscle spindle afferents from the gastrocnemius muscle of the cat before, during, and after cold shivering of the animal, utilizing ramp stretches of the same muscle. By plotting the static, dynamic, and acceleration responses against the corresponding stretch parameter (length, velocity, or acceleration), characteristic curves of the three sensitivities are obtained. The sensitivity changes occurring during shivering are indicated by slope changes of the individual curves. It is found that during shivering the spindles exhibit irregular or missing changes in their length sensitivity. Their velocity and acceleration sensitivities are regularly decreased. The data obtained are compared with results obtained by other investigators. The probable nature of the complex change of fusimotor innervation which takes place during natural cold shivering is discussed. P.G.

A69-42092

THE EFFECT OF DYNAMIC AND STATIC STRETCHING ON THE SPONTANEOUS FREQUENCY OF ISOLATED PACEMAKER TISSUE OF THE HEART (DER EFFEKT DYNAMISCHER UND STATISCHER DEHNUNG AUF DIE SPONTANFREQUENZ DES ISOLIERTEN HERZSCHRITTMACHERS).

K. Golenhofen and H. Lippross (Marburg, Universität, Physiologisches Institut, Marburg an der Lahn, West Germany).

Pflügers Archiv, vol. 309, no. 2, 1969, p. 145-158. 26 refs. In German.
Research supported by the Deutsche Forschungsgemeinschaft.

Investigation of isolated pacemaker tissue from a rabbit heart (sinoatrial node) subjected to dynamic and static stretching. During sinusoidal stretching with an amplitude of 5 to 10 per cent of the resting length no change in spontaneous frequency could be observed. Only a superposition of the active contraction with the passive effect of stretching appeared in the tension record. Pulsation interference occurred when the stretching frequency was adjusted to values similar to the spontaneous frequency of the tissue. A coupling between the two oscillations with a constant phase angle could never be produced. Static stretching of the same amount had no effect on the steady-state values of the spontaneous frequency. It is concluded that normal pacemaker tissue of the heart is extremely insensitive to stretching compared with other spontaneously active muscle tissues. P.G.

A69-42093

MECHANICAL COUPLING EFFECTS BETWEEN RESPIRATION AND HEART RHYTHM (MECHANISCHE KOPPELUNGSWIRKUNGEN DER ATMUNG AUF DEN HERZSCHLAG).

K. Golenhofen and H. Lippross (Marburg, Universität, Physiologisches Institut, Marburg an der Lahn, West Germany).

Pflügers Archiv, vol. 309, no. 2, 1969, p. 159-166. 16 refs. In German.
Research supported by the Deutsche Forschungsgemeinschaft.

Study of a possible coupling mechanism through which the heart rhythm is affected by respiration with particular consideration of direct mechanical influences. In anesthetized rabbits the vagus nerves were cut, and the heart rate was lowered by peripheral vagus stimulation to a frequency near the respiratory rate. Under these conditions a synchronization with a constant phase angle between the two rhythms could be observed. Application of beta-receptor blocking agents did not affect this coordination. The coupling effect

is explained by mechanical influences of respiration, the heart rhythm being triggered by distension during inspiration. This mechanism seems not to be involved in the normal coordination of cardiac action and respiration, but it is believed that it may play a role in pathophysiology. P.G.

A69-42094
INCREASED BLOOD OSMOLARITY AND ITS EFFECT ON RESPIRATION OF DEHYDRATING MEN.
Leo C. Senay, Jr. (St. Louis University, School of Medicine, St. Louis, Mo.).
Pflügers Archiv, vol. 309, no. 2, 1969, p. 167-175. 15 refs.
NIH Grants No. 5 R01; No. He-07075; No. 1K3 HE-25.

Experimental study of blood osmolarity in an attempt to separate respiratory effects of changes in body temperature from changes in body fluid osmolarity. Eight unacclimatized nude male subjects were alternately exposed to room temperature (25.5 to 27.8 deg C) and heat (43.3 deg C dry bulb, 28 deg C wet bulb). It was found that when the subjects were in the heat chamber respiration was affected by an elevated rectal temperature and plasma osmolarity. Removal of subjects from the heat decreased the rectal temperature but did not significantly change osmolarity. Effects of rectal temperature and osmolarity on respiration could then be separated. The data obtained indicate that increased plasma osmolarity reduced respiratory responses to elevated body temperature. Decreased sensitivity to inhaled 3 per cent carbon dioxide also correlated with increases in plasma osmolarity, thus assuming opposing actions of elevated body temperature and increased osmolarity on respiration of men undergoing progressive dehydration. P.G.

A69-42095
THE EFFECT OF TRAINING ON SOME ISOMETRIC CONTRACTION CHARACTERISTICS OF A FAST MUSCLE.
R. A. Binkhorst (Nijmegen, Catholic University, Dept. of Physiology, Nijmegen, Netherlands).
Pflügers Archiv, vol. 309, no. 3, 1969, p. 193-202. 16 refs.

Study of the effect of training on isometric contraction of a fast muscle in a group of female rats. The fast m. plantaris was overexerted by denervating the m. gastrocnemius and m. soleus. Part of the rats were trained systematically on a motor-driven endless belt set at an inclination. Isometric contraction characteristics were studied in these and in control rats. Muscle weight and tetanic muscle force of the experimental group both increased to about 130 per cent of that of control rats of the same age. Training had no additional effect on the mechanical characteristics studied in the muscles of the denervated group, no changes occurred in the twitch contraction time nor in the tetanic force per unit of weight. A comparison is made with the findings on slow muscles as reported in the literature. G.R.

A69-42096
DISSOCIATION OF HUMAN HEMOGLOBIN (ZUR DISSOZIATION DES HUMAN-HÄMOGLOBINS).
W. K. R. Barnikol and G. Thews (Mainz, Universität, Physiologisches Institut, Mainz, West Germany).
Pflügers Archiv, vol. 309, no. 3, 1969, p. 224-231. In German.

Development of a model for the dissociation of human hemoglobin into subunits, which takes into account the molecular explanation of the oxygen dissociation curves. The model is characterized by the symmetrical dissociation of the Hb molecule into dimer subunits, each with an alpha- and a beta-chain, as well as the further dissociation into monomers. Moreover, a stabilizing intermediary substance, Z, must be assumed, in order to explain quantitatively the unusual molecular weight concentration dependence. Taking Schachman and Edelstein's (1966) experimental results as a basis, the parameters of the model are then determined with the aid of an electronic computer. G.R.

A69-42097
INTERPRETATION OF THE OXYGEN-DISSOCIATION CURVE OF HUMAN HEMOGLOBIN (ZUR INTERPRETATION DER O_2-BINDUNGSKURVE DES HUMAN-HÄMOGLOBINS).
W. K. R. Barnikol and G. Thews (Mainz, Universität, Physiologisches Institut, Mainz, West Germany).
Pflügers Archiv, vol. 309, no. 3, 1969, p. 232-249. 30 refs. In German.

Discussion of a hypothesis regarding the hemoglobin oxygen reaction, using an elementary model which is able to explain quantitatively the dependence of molecular weight and the oxygen dissociation curve on the hemoglobin concentration. According to this hypothesis, the tetramer hemoglobin dissociates symmetrically into its dimer and monomer subunits. Each of these subunits has a specific oxygen affinity, which is the same for every stage of their oxygenation. An essential aspect of this hypothesis, moreover, is the effect of a low molecule intermediary substance, Z, which stabilizes the tetramer. The parameter values obtained from the numerical calculations allow the Z substance to be identified as calcium and/or magnesium ions. By taking into consideration the complex-forming tendency of these bivalent ions, the other known properties of the oxygen dissociation curve can be easily explained qualitatively. G.R.

A69-42098
DIGITAL SIMULATION OF A SPATIAL DIFFUSION MODEL OF OXYGEN SUPPLY IN BIOLOGICAL TISSUE (DIGITALE SIMULATION EINES RÄUMLICHEN DIFFUSIONSMODELLES DER O_2-VERSORGUNG BIOLOGISCHER GEWEBE).
W. Grunewald (Max-Planck-Institut für Arbeitsphysiologie, Dortmund, West Germany).
Pflügers Archiv, vol. 309, no. 3, 1969, p. 266-284. 39 refs. In German.
Research supported by the Deutsche Forschungsgemeinschaft.

Development of a three-dimensional digital model for understanding the oxygen pressure fields (as measured by means of platinum needle electrodes) and the supply conditions in the organism. Enlarging traditional conceptions, this model permits, in the case of steady states, the calculations of spatial oxygen pressure fields between asymmetric capillary structures. The pressure variations of the capillaries were checked with their supply areas in the model. The diffusion equation was solved iteratively by transition to a difference equation. The iteration procedure was carried out by means of the Liebmann process in the form of overrelaxation. The supply areas and the minimum pressures in the oxygen pressure fields of three capillary structures are compared, assuming conditions of normoxia and venous hypoxia in the gray substance of the human brain. Possibilities of refining and enlarging the digital model are discussed. G.R.

A69-42099
INFLUENCE OF SPINAL CORD TEMPERATURE ON THE STRETCH RESPONSE OF TONIC AND PHASIC α-MOTONEURONS (DER EINFLUSS DER RÜCKENMARKSTEMPERATUR AUF DIE DEHNUNGSANTWORT TONISCHER UND PHASISCHER α-MOTONEURONE).
W.-J. Stelter and F. W. Klussmann (Max-Planck-Gesellschaft zur Förderung der Wissenschaften, William G. Kerckhoff-Herzforschungsinstitut, Bad Nauheim, West Germany).
Pflügers Archiv, vol. 309, no. 4, 1969, p. 310-327. 35 refs. In German.

Discussion of the influence of spinal cord temperature on the stretch response of tonic and phasic alpha-motoneurons on the basis of filament recordings from ventral roots in 25 lightly anesthetized

cats. Reduction of spinal cord temperature resulted in an increase in excitability and frequency of both tonic and phasic motoneurons, the activation of the smaller tonic alpha-unit always preceding that of the greater phasic alpha-motoneurons. The maximum number of stretch responses of the majority of the small tonic alpha-units was found close to the range of normal body temperatures. G.R.

A69-42100
DETERMINATION OF BLOOD VISCOSITY IN VITRO WITH A MICROGLASS FIBER VISCOSIMETER.
D. Braasch (Marburg, Universität, Physiologisches Institut, Marburg an der Lahn, West Germany).
Pflügers Archiv, vol. 309, no. 4, 1969, p. 350-355. 9 refs.

Investigation of the microrheological property of blood with a new micro method in which a glass fiber driven by a constant force traverses a blood sample. The speed of the glass fiber is directly proportional to the viscosity of the blood. Because of the small diameter of the fiber, the method is considered to be more sensitive to the intercellular friction of the erythrocytes. The values obtained by the new method resembled those obtained with the aid of coaxial viscosimeters. G.R.

A69-42101
SOUND-CORRELATED DC CHANGES ON THE INTACT SKULL OF HUMAN SUBJECTS (AKUSTISCHEN REIZEN ZUGEORDNETE GLEICHSPANNUNGSÄNDERUNGEN AM INTAKTEN SCHÄDEL DES MENSCHEN).
E. David, P. Finkenzeller, S. Kallert, and W. D. Keidel (Erlangen-Nürnberg, Universität, I. Physiologisches Institut, Erlangen, West Germany).
Pflügers Archiv, vol. 309, no. 4, 1969, p. 362-367. 14 refs. In German.

Study of sound-evoked dc changes on the intact skull of adult human subjects on the basis of data obtained with AgCl electrodes. The data were analyzed by a computer. The dc changes were maintained during the whole duration of the stimulus. They are greatest at the vertex and depend on the stimulus intensity. The intensity function has been investigated and is characterized by the slopes of the approximation lines as a function of the time of analysis, taking into account the correlation between the approximating lines and the measured data. G.R.

A69-42103
THE DYNAMICS OF PULSATILE FLOW IN THE CORONARY ARTERIES.
Thomas Kenner (Erlangen-Nürnberg, Universität, II. Physiologisches Institut, Erlangen, West Germany; Virginia, University, Div. of Biomedical Engineering, Charlottesville, Va.).
Pflügers Archiv, vol. 310, no. 1, 1969, p. 22-34. 11 refs.
Research supported by the Graduate Incentive Fund; NIH Grant No. HE-09694.

Investigation of pulsatile flow in the coronary arteries by means of a simplified model of a homogeneous elastic tube used to explain details and oscillations of the coronary flow pattern. Flow patterns constructed by use of this model were compared with flow pulses recorded in anesthetized dogs in the left circumflex coronary artery with an electromagnetic flowmeter. A characteristic feature of the apparent input impedance of a coronary artery has been found experimentally, and could be explained by the fact that the myocardial contraction serves as an additional energy source within the coronary system. The possible usefulness and physiological importance of analytical methods to the hemodynamics of the coronary arteries are discussed. O.H.

A69-42102
COMBINED ADRENERGIC BLOCKADE IN EXPERIMENTAL HEMORRHAGIC HYPOTENSION.
G. Zierott, E. Pappova, and P. Lundsgaard-Hansen (Bern, Universität, Abteilung für experimentelle Chirurgie, Berne, Switzerland).
Pflügers Archiv, vol. 310, no. 1, 1969, p. 1-15. 45 refs.
Swiss National Foundation Grant No. 4423.

Study of the effects of alpha receptor blockade, beta receptor blockade, and combined adrenergic blockade on blood loss, tolerated period, and metabolic sequels of hypotension in dogs. The results show that untreated animals, in addition to blood loss, lost plasma from the circulation, whereas blocked animals showed plasma refill. The difference in circulating blood volume during hypotension was therefore greater than suggested by external blood loss. (Author)

A69-42104
THE DISCREPANCY BETWEEN THERMOMETRY AND CALORIMETRY DURING EXERCISE.
J. W. Snellen (Nijmegen, Catholic University, Dept. of Physiology, Nijmegen, Netherlands).
Pflügers Archiv, vol. 310, no. 1, 1969, p. 35-44. 14 refs.

Investigation of the discrepancy between calorimetry and thermometry during prolonged exercise in a hot and dry environment. Under these conditions, a man seems to maintain a caloric equilibrium for about one hour, while when the man dehydrates, a continuous rise in rectal temperature may be observed simultaneously. This discrepancy was investigated by measuring calorimetrically the body heat storage during exercise. In a series of experiments work and heat load were kept constant throughout, but the exposure time was increased in steps of 18 min, up to 144 min. The heat storage did not alter between 54-th and the 108-th min. In the same period, the rectal temperature rose steadily. O.H.

A69-42105
CORONARY SINUS OUTFLOW AND O_2 CONTENT IN ANTERIOR CARDIAC VEIN BLOOD AT DIFFERENT LEVELS OF RIGHT VENTRICLE PERFORMANCE.
G. Marchetti, L. Merlo, and V. Noseda (Simes S.p.A., Istituto di Cardiologia Sperimentale, Milan, Italy).
Pflügers Archiv, vol. 310, no. 2, 1969, p. 116-127. 15 refs.

Investigation of a number of hypotheses regarding the causes of the increase which occurs in the coronary sinus outflow when the right ventricle systolic pressure and the oxygen content in the anterior cardiac vein blood are increased. Experiments were performed on anesthetized open-chest dogs, showing that the increase in coronary sinus outflow is not due to a change in the distribution of venous blood between the coronary sinus and the deep venous system, but is secondary to the increased left coronary artery inflow. The oxygen content of the coronary sinus blood was found to be constantly lower than that of the anterior cardiac and Thebesius veins. G.R.

A69-42106
CUTANEOUS CIRCULATION DURING ADAPTATION TO HIGH ALTITUDE (LA CIRCULATION CUTANEE AU COURS DE L'ADAPTATION A L'ALTITUDE).
J. P. Martineaud, J. Durand, J. Coudert, and S. Seroussi (Paris, Université, Département de Physiologie, Paris, France; Institut Bolivien de Biologie d'Altitude, La Paz, Bolivia).
Pflügers Archiv, vol. 310, no. 3, 1969, p. 264-276. 26 refs. In French.
Research supported by the Centre National de la Recherche Scientifique, the Institut National de la Santé et de la Recherche Médicale, and the Délégation Générale à la Recherche Scientifique et Technique.

Measurement of the blood flow, volume, and venous pressure in the right hand, which is considered as representative of the cutaneous vascular bed. The measurements are made at low (from 50 to 400 m) and high altitude (from 3750 to 4800 m) in residents and newcomers. The results obtained demonstrate an increase in the tone of both resistance and capacitance vessels at high altitude. These changes are more marked when the skin temperature is higher—i.e., when the cutaneous circulation is increased. Extrapolating these results to the whole skin area, it is concluded that the cutaneous circulation acts as a blood flow and blood volume reservoir during the circulatory adjustments caused by high-altitude hypoxia. Z.W.

A69-42118
EFFECT OF OXYGEN ON THE FREQUENCY OF X-RAY INDUCED SOMATIC CROSSING OVER IN DROSOPHILA MELANOGASTER.
Henry Stauffer (California, University, Dept. of Zoology, Berkeley, Calif.).
Nature, vol. 223, Sept. 13, 1969, p. 1157, 1158. 10 refs.

Description of experiments presenting evidence of an oxygen effect for somatic crossing over in the fruit fly. It is noted that crossing over in cells destined to form bristles can be detected in the adult fly by the appearance of spots of yellow or singed bristles. Larvae of *Drosophila* were reared under identical conditions, at 25 deg C, and at an average age of 35 hours they were exposed for 2 hours to various concentrations of oxygen. Thereafter, half the larvae subjected to each oxygen concentration were returned directly to air. The other half were given 1326 r at a dose rate of 102 r/min. All sets of larvae were allowed to pupate and hatch under identical conditions. The emerging adult flies were aged for 24 to 36 hours and examined for spots on the abdominal tergites. It was found that varying the gaseous environment both during and after the X-ray treatment modifies the number of spots. P.G.

A69-42119
ENCODING OF NERVE SIGNALS FROM RETINAL RODS.
M. Alpern, W. A. H. Rushton, and S. Torri (Florida State University, Institute of Molecular Biophysics, Tallahassee, Fla.).
Nature, vol. 223, Sept. 13, 1969, p. 1171, 1172. 5 refs.
AEC-NSF-supported research.

Measurement of rod signals elicited by flashes of various strengths in the human eye. The procedure used in measuring these signals is described. From the results obtained a relation between the size of the nerve signal generated in human retinal rods and the energy of light flashes is derived. It is shown that the signal is proportional to the light up to 100 quanta absorbed per rod. It is noted that the relationship found has the general form of receptor potentials, S-potentials and so on, and, in particular, it coincides with the a-wave of the electroretinogram. P.G.

A69-42151 *
PROTEIN CATABOLISM IN YOUNG MICE FOLLOWING WHOLE-BODY X IRRADIATION.
S. W. Lippincott, N. A. Azzam, and C. C. Rogers (Virginia, Medical College, Dept. of Radiology, Div. of Radiation Biology and Div. of Radiation Therapy, Richmond, Va.).
(Radiological Society of North America, Scientific Assembly and Annual Meeting, 54th, Chicago, Ill., Dec. 1-6, 1968.)
Radiology, vol. 92, Mar. 1969, p. 629, 630.
AEC-supported research; Grant No. NGR-47-002-012.

Determination of the effects of whole-body irradiation on protein degradation in young mice with the aid of radioactive-iodine-labeled albumin. It is found that the protein catabolism is significantly increased in groups receiving doses of 600 and 900 rads. A dose-response relationship of the catabolism is indicated, since the 900-rad dose produced a markedly higher response than the 600-rad dose (p less than 0.01). P.G.

A69-42168
ON THE COMBINATION OF EVIDENCE FROM THE EYE AND EAR.
D. W. J. Corcoran (U.S. Naval Material Command, Naval Command and Control Communications Center, San Diego, Calif.) and D. L. Weening (San Diego State College, San Diego, Calif.).
Ergonomics, vol. 12, May 1969, p. 383-394. 11 refs.

Four signals varying in frequency (1001 or 1201 cps) and beat-rate (2 or 3 beats per sec) were presented for identification in noise over an oscilloscope (V), over earphones (A), or over both systems simultaneously (AV). Four models were used to predict AV performance from performances on A and V. The most successful model assumed that the eye and ear behave as independent observers, that the sensors present both a discrete decision and a measure of confidence to the decision system, that the certainty is proportional to the probability of the discrete decision, and that an optimal weighting of certainties occurs in cases of conflict between A and V. Reasons for divergences between bimodal word recognition and detection studies are discussed. (Author)

A69-42169
RELATIONSHIPS OF OXYGEN CONSUMPTION, VENTILATION AND CARDIAC FREQUENCY TO BODY WEIGHT DURING STANDARDIZED SUBMAXIMAL EXERCISE IN NORMAL SUBJECTS.
J. E. Cotes (Medical Research Council, Pneumoconiosis Research Unit, Penarth, Glamorgan, Wales).
Ergonomics, vol. 12, May 1969, p. 415-427. 29 refs.

Investigation of the validity of the relation of oxygen uptake, ventilation, and cardiac frequency to body weight during walking, standardized stepping, and cycling on a stationary ergometer. It is found that in normal males during submaximal exercise the oxygen uptake and ventilation are linear functions of body weight. In normal females the mean oxygen uptakes do not differ materially from those of males of comparable weight. It is noted that the convention of expressing results per kilogram of body weight or square meter of body surface may give rise to error and that for ventilation this may be avoided by the use of the regression on oxygen uptake. Allowance should also be made for differences in oxygen uptake due to the effects of practice. For the cardiac frequency a similar adjustment to a constant oxygen uptake yields values which are negatively correlated with body weight for walking on a treadmill, but not, in this instance, for standardized stepping and cycling. P.G.

A69-42195
PSYCHOLOGICAL, PSYCHOPHYSIOLOGICAL, AND BIOCHEMICAL CORRELATES OF PROLONGED SLEEP DEPRIVATION.
Robert O. Pasnau, Anthony Kales (California, University, School of Medicine, Los Angeles, Calif.), Robert T. Rubin (U.S. Navy, Medical Neuropsychiatric Research Unit, San Diego; California, University, School of Medicine, Los Angeles, Calif.), Paul Naitoh (U.S. Navy, Medical Neuropsychiatric Research Unit, Psychophysiology Div., San Diego, Calif.), Grant G. Slater (Veterans Administration Center, Dept. of Neurobiochemistry, Los Angeles, Calif.), and Edward J. Kollar.
(American Psychiatric Association, Annual Meeting, 124th, Boston, Mass., May 13-17, 1968.)
American Journal of Psychiatry, vol. 126, Oct. 1969, p. 488-497. 30 refs.

Results of a study in which four healthy adult males underwent 205 hours of sleep deprivation. Although the subjects suffered transient ego disruptive phenomena, they did not appear to undergo

psychopathological reactions extending beyond the period of sleep deprivation. Detailed psychological, physiological, and biochemical findings are reported. (Author)

A69-42213 #
THE SUN AND LUNAR HABITATIONS (LE SOLEIL ET DES HABITATIONS LUNAIRES).
M. Touchais (Centre National de la Recherche Scientifique, Laboratoire d'Héliotechnique, Marseille, France).
Coopération Méditerranéenne pour l'Energie Solaire, Bulletin, no. 16, July 1969, p. 47-57. In French.

Examination of lunar conditions from the viewpoint of future human settlements on the moon. The effect of solar and lunar radiation, vacuum, and lunar gravitation on the biological environment of man is examined. Utilization of solar energy for generating the electricity necessary for conditioning the habitations are described. The urgent need for an extensive research program to examine the possibility of human habitation on the moon is stressed. Z.W.

A69-42216
THE COMPATIBILITY OF MAN IN THE MICROWAVE ENVIRONMENT.
Leo P. Inglis (North American Rockwell Corp., Atomics International Div., Canoga Park, Calif.).
IN: INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, ELECTROMAGNETIC COMPATIBILITY SYMPOSIUM, 11TH, ASBURY PARK, N.J., JUNE 17-19, 1969, RECORD. (A69-42215 23-09)
New York, Institute of Electrical and Electronics Engineers, Inc., 1969, p. 7-11. 8 refs.

Discussion of the behavior of the human body in response to microwave irradiation, and of appropriate methods of dealing with possible dangers to human beings arising from microwaves. The conversion of microwave energy into heat is a principal mode of damage to living organisms, especially to the eyes, but much recent research supports the view that nonthermal effects are substantive. Russian workers continue to report a wider variety of effects than American workers, and they are more concerned with the effect of microwave fields on information storage in living systems. This greater concern is reflected in the published Russian exposure limits, which are lower than the limits generally used in this country. Organizations whose personnel are exposed to microwave fields are urged to promulgate, and observe, suitable safety regulations. G.R.

A69-42344 #
EFFECT OF LASER RADIATION ON THE ELECTRICAL CONDUCTIVITY OF THE ANIMAL LIVER (VPLIV VIPROMINIUVANNIA OPTICHNOGO KVANTOVOGO GENERATORA /LAZERA/ NA ELEKTROPROVIDNIST' PECHINKI TVARIN).
E. P. Sidorik, M. I. Danko, and V. V. Nikitchenko (MOZ, Kiivs'kii Naukovo-Doslidnii Institut Eksperimental'noi ta Klinichnoi Onkologii, Kiev, Ukrainian SSR).
Akademiia Nauk Ukrains'koi RSR, Dopovidi, Seriia B–Geologiia, Geofizika, Khimiia i Biologiia, vol. 31, Aug. 1969, p. 738-741. 8 refs. In Ukrainian.

Investigation of the effect of neodymium laser radiation on the electrical and histomorphological properties of the liver in groups of white rats and Syrian hamsters. Opened liver areas of the animals, 0.8 to 1 mm in diameter, were exposed to single laser pulses of 250 J; the resistivity and permittivity of the liver were measured in an experimental setup over periods of up to 1 year after the irradiation. The changes established in the electrical and histomorphological properties of irradiated livers are discussed. V.Z.

A69-42363
FLIGHT AND ADRENOSYMPATHETIC REACTION.
A. Escousse (Dijon, Université, Laboratoire de Physiologie, Dijon, France).
Flight Safety, vol. 3, Sept. 1969, p. 3-5.

Study of the relative contributions of physical and nervous stresses to adrenosympathetic reactions in flight. It is found that in normal conditions, the elimination of catecholamines and the importance of the adrenosympathetic reaction is smaller in the trained person than in the nonadapted and sedentary subject. The poor adaptation is shown by an increase of secretion of epinephrine, whereas the inherent consequence of the muscular work is a significant increase in the excretion of vanillyl mandelic acid. It is not possible to judge in an absolute way the adaptation of a person to definite circumstances. G.R.

A69-42364
THE BODY IMAGE OF THE AVIATOR.
G. J. Tucker, R. E. Reinhardt, and N. B. Clarke.
Flight Safety, vol. 3, Sept. 1969, p. 6-8. 12 refs.

Study of the concept of the body image in aviation through analysis of projective inkblot tests. The group Rorschach was administered to (1) an experienced group of 30 helicopter pilots, 26 propeller pilots, and 14 jet pilots, (2) a group of 30 nonpilots, and (3) a group of relatively inexperienced pilots who were having flight difficulty. The responses were scored in a blind manner by two independent raters with a high degree of reliability. Using this technique, it was possible to differentiate jet and helicopter pilots from all other groups. The results are discussed in terms of perceptual factors relating to the environment of the aviator and his own body, individual personality factors, and social factors. G.R.

A69-42365
THE USE OF SPECIALLY DEVISED THEMATIC APPERCEPTION CARDS IN AVIATION PSYCHOLOGY.
L. R. C. Haward (Aeromedical International, Chichester, England).
Flight Safety, vol. 3, Sept. 1969, p. 12-14. 12 refs.

Discussion of various sets of thematic apperception test (TAT) cards designed for particular problems in aviation psychology. Special series of stimulus cards are discussed which were created for assessing the attitudes of naval recruiting. Other series of TAT cards were prepared as a selection procedure for sport parachutists and for a specialized minority group showing deviant respiratory responses during ejections. At the individual level, the development of a set of cards for a commercial pilot with psychiatric problems was undertaken. G.R.

A69-42366
FLIGHT SIMULATORS AND AIRLINE PILOT TRAINING.
W. J. Johnson (British European Airways Corp., Southall, Middx., England).
Flight Safety, vol. 3, Sept. 1969, p. 24, 25.

Discussion of the role of the flight simulator in airline pilot training. The reasons for using flight simulators are examined. Three stages of skilled learning are cited, and crew and individual training is discussed. Part and whole simulators are considered, and aspects of performance measurement are described. Some needed future developments are pointed out. G.R.

A69-42443
ON MAN-MACHINE CONTROL.
R. Tomović (Institut Mihailo Pupin za Automatizaciji i Telecumunikaciju, Belgrade, Yugoslavia).
Automatica, vol. 5, July 1969, p. 401-404.

Study of man-machine (or semiautomatic) control to combine in a complementary way the capabilities of the man and the machine

for optimal decision making. Disadvantages and limitations of fully automatic control are analyzed. Semiautomatic control is discussed for large systems and human organizations. Basic hypotheses are developed concerning decision implementation in large systems having autonomy of subsystems. The one-level system using all available information for decision making and the multilevel system using only selected information are analyzed. The hierarchical structure in multilevel systems is explained, and an example of three-level models is given, the highest level being the human brain. Principles of the optimization of man-machine systems are discussed. O.H.

A69-42444
PARADOXICAL INHIBITION—A NEGATIVE FEEDBACK PRINCIPLE IN OSCILLATORY SYSTEMS.
F. A. Roberge (Medical Research Council, Research Group in Neurological Sciences, Ottawa, Canada).
Automatica, vol. 5, July 1969, p. 407-416. 23 refs.
Research supported by the Medical Research Council of Canada.

Study of paradoxical inhibition, which is the state of reduced excitability induced by a local response of the excitable membrane. This mechanism may play an important and unsuspected role at various levels of organization of living systems. It is described in detail with the help of a mathematical model of the nerve membrane. The model is a modified version of FitzHugh's model, which allows the simulation of local responses and their representation in the phase plane. Neural integration is used as an example of the operation of the mechanism of paradoxical inhibition. It is concluded that paradoxical inhibition may constitute a principle of negative feedback action in systems where oscillation is the normal mode of behavior. O.H.

A69-42516
BIOLOGIC EFFECTS OF RADIO AND MICROWAVES—PRESENT KNOWLEDGE; FUTURE DIRECTIONS.
Alvin M. Burner (USAF, Systems Command, Aerospace Medical Div., Brooks AFB, Tex.).
IN: INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INTERNATIONAL CONFERENCE ON COMMUNICATIONS, BOULDER, COLO., JUNE 9-11, 1969, CONFERENCE RECORD. (A69-42500 23-07)
New York, Institute of Electrical and Electronics Engineers, Inc. (IEEE ICC Conference Publications. Volume 5), 1969, p. 32-1 to 32-6.

General survey of the results of studies of biological effects of radio waves and microwaves carried out in the U.S. and the Soviet Union. The topics covered include microwave thermal and nonthermal effects, exposure standards, areas of uncertainty, and future research needs. Substantial differences between the U.S. and Soviet approaches to the assessment of microwave radiation hazards are pointed out. The need for revaluation of the U.S. exposure standards in the light of the more unfavorable findings of Soviet workers is indicated. V.Z.

A69-42528
THE CO_2 COMPENSATION POINT, HILL ACTIVITY AND PHOTORESPIRATION.
J. S. Bunt (Miami, University, Institute of Marine Sciences, Miami, Fla.).
Biochemical and Biophysical Research Communications, vol. 35, June 6, 1969, p. 748-753. 9 refs.
Research supported by the Martin Marietta Corp.; NSF Grant No. GB-6896.

Examination of oxygen exchange in *Scenedesmus* and *Chlorella* using mass spectrometry, leading to the development of a scheme which depends on accepting carbon dioxide dependence for Hill activity in whole cells to explain changes in the carbon dioxide compensation point related to oxygen concentration. The scheme accommodates photorespiration and increased oxygen consumption in the light not related to carbon dioxide release. (Author)

A69-42533
HEMOLYTIC EFFECTS OF ENERGY DISSIPATION IN FLOWING BLOOD.
M. Bluestein and L. F. Mockros (Northwestern University, Technological Institute, Evanston, Ill.).
Medical and Biological Engineering, vol. 7, Jan. 1969, p. 1-16. 18 refs.
NIH Grants No. HE-31367; No. HE-09536; No. FR-00018.

Typical extracorporeal circulation systems subject blood to abnormal and severe physical conditions. The local rate of mechanical hemolysis under such conditions is postulated to be a function of the local rate of mechanical energy dissipation. This hypothesis was tested by examining the rates of hemolysis in four types of flow. The average rate of hemolysis is expressed as a power function of the average dissipation rate. In the absence of cavitation, the lysis rate in all four cases depends on the average dissipation rate raised to the 1.2 power. The constant of proportionality in each case, however, depends on the spatial distribution of dissipation. The more nonuniform the dissipation, the greater the hemolysis rate for the same average dissipation rate. No statistical correlation was found between the tendency of a particular blood to lyse osmotically and the tendency to lyse mechanically. (Author)

A69-42554
BEHAVIORAL AND PHYSIOLOGICAL CHANGES DURING PROLONGED IMMOBILIZATION PLUS PERCEPTUAL DEPRIVATION.
John P. Zubek, L. Bayer, S. Milstein, and Jean Mary Shephard (Manitoba, University, Winnipeg, Manitoba, Canada).
Journal of Abnormal Psychology, vol. 74, no. 2, 1969, p. 230-236. 27 refs.
Defence Research Board Grant No. 9425-08; PHS Grant No. MH-08748.

Study showing that subjects who successfully completed one week of immobilization plus perceptual deprivation (IPD group) showed a greater slowing of occipital EEG activity, and a poorer performance on a battery of intellectual and perceptual-motor tests than did subjects exposed to a similar duration of either immobilization (I group) or a recumbent control condition (RC group). During the one-week period, the IPD group also showed a significant increase in urinary excretion of noradrenaline, but not of adrenaline, relative to the I and RC groups. No significant differences were observed on behavioral measures of subjective stress and mood. (Author)

A69-42555 *
EFFECT OF INDUCED STRESS ON CONVERGENT AND DIVERGENT THINKING.
Harry D. Krop, Cecilia E. Alegre, and Carl D. Williams (Miami, University, Coral Gables, Fla.).
Psychological Reports, vol. 24, June 1969, p. 895-898. 12 refs.
Grant No. NGR-10-007-010.

Analysis of measures of convergent and divergent thinking obtained from college students before and after the presentation of either a disturbing motion picture film or a benign control film. Induced stress was found to inhibit divergent thinking but to have no effect on convergent thinking. The data suggest that certain intellectual abilities are influenced more readily than others by psychological stress. (Author)

A69-42574
FUNDAMENTAL PHYSICAL CONCEPTS UNDERLYING ABSORPTION OF MICROWAVE ENERGY BY BIOLOGICAL MATERIAL.
Edward H. Grant (London, University, Queen Elizabeth College, Physics Dept., London, England).
Non-Ionizing Radiation, vol. 1, Sept. 1969, p. 77-79. 8 refs.

Theoretical study of microwave absorption by biological materials designed to show the degree of damage sustained by living organisms exposed to microwave radiation. Discussed as a major factor of microwave radiation damage is the distribution of energy between the reflected, transmitted, and absorbed portions of incident microwave radiation as a function of frequency and of the complex permittivity and conductivity of the constituents of the medium. Guidelines are given for biological damage simulation techniques based on the fact that the human body contains 70 per cent water. V.Z.

A69-42575
EFFECT OF PULSED MICROWAVES AT X-BAND ON SKIN METABOLISM.
J. C. Lawrence (Medical Research Council, Industrial Injuries and Burns Research Unit, Birmingham Accident Hospital, Birmingham, England).
Non-Ionizing Radiation, vol. 1, Sept. 1969, p. 80-84. 14 refs.

Description of an apparatus used to expose skin to a frequency of 9.6 GHz with a pulse duration of 0.25 microsec and a repetition frequency of 4 kHz, thus giving a ratio of peak to mean power of 1000 to 1. With this apparatus it was found that an exposure of 6,000 mJ/sq cm reduced respiratory activity of skin by 50 per cent. Other experiments were made to determine the effect of pulsed microwave energy on certain specific aspects of skin biochemistry, especially biosynthesis of intercellular materials and specific cell components. The histology of skin after exposure to microwaves was also investigated. The findings of these experiments are compared with those obtained previously using a continuous source of radiation. (Author)

A69-42578
EFFECT OF RUBY LASER ON WHITE GUINEA-PIG SKIN IN TISSUE CULTURE.
J. C. Lawrence (Medical Research Council, Industrial Injuries and Burns Research Unit, Birmingham, England).
Non-Ionizing Radiation, vol. 1, June 1969, p. 18-22. 14 refs.

Investigation of the respiration rates and ear skin histology in groups of albino guinea pigs after exposures to various doses of coherent ruby laser light at 694 nm. The results for respiration rates suggest a graded response to radiation, with a 50 per cent respiration reduction at a power density of 1.9 J/sq mm. A histological examination of three-day ear skin cultures showed that more than 30 per cent of the respiratory damage was associated with the abnormal culture appearance. High power levels were required to produce an immediate effect which appeared to cause an explosive disruption of the skin. Laser power levels resulting in detectable skin damage were comparable to those causing damage to enzymes. The results of the study are generally consistent with the hypothesis that tissue damage caused by laser radiation is due to heat. V.Z.

A69-42579
EFFECTS OF MICROWAVE RADIATION ON TISSUE—A SURVEY OF BASIC MECHANISMS.
H. P. Schwan (Pennsylvania, University, Moore School of Electrical Engineering, Philadelphia, Pa.).
Non-Ionizing Radiation, vol. 1, June 1969, p. 23-31. 6 refs.
NIH Grant No. HE-01253-15; Contract No. Nonr-551(52).

Discussion of present knowledge about the effects of microwaves on mankind, tissues, and biological systems at large. The topics dealt with include absorption characteristics and electrical properties of tissues, effects of reflections at boundaries between various tissues, relative absorption cross section of mankind, and field-induced force effects on small particles in general and cells and macromolecules in particular. Thermal effects are distinguished from nonthermal ones. While "strong" interactions of microwaves with biological material are largely understood, "weak" interactions are uncertain. Present radiation safety standards are based on present day knowledge of strong interactions, and pertinent considerations are indicated. (Author)

A69-42580
POSSIBLE ENHANCEMENT OF PHOTOSYNTHESIS BY LASER IRRADIATION.
C. Susskind and I. Garro (California, University, Electronics Research Laboratory, Berkeley, Calif.).
Non-Ionizing Radiation, vol. 1, June 1969, p. 45, 46. 9 refs.
Grant No. AF AFOSR 139-67.

Brief description of two experiments in which a greater intensity of photosynthesis was achieved in samples of seaweed *Ulva* after alternate exposures to He-Ne CW laser radiation at 633 nm and tungsten-lamp white light passed through an i.f. narrow-band filter. The oxygen evolution ratios after laser irradiation were multiples of those obtained after white light irradiation. V.Z.

A69-42602
ATTEMPT AT RATIONAL TREATMENT OF THE MEDICAL AID PROBLEM AFTER A LARGE CAPACITY AIRCRAFT ACCIDENT AT AN AIRPORT (TENTATIVE DE TRAITEMENT RATIONNEL DU PROBLEME DES SECOURS MEDICAUX APRES ACCIDENT D'UN AVION A GRANDE CAPACITE SUR UN AEROPORT).
Bergot (Aéroport de Paris, Département Médical, Paris, France).
Revue de Médecine Aéronautique et Spatiale, vol. 8, 2nd Quarter, 1969, p. 77-81. In French.

Study of the medical aid, equipment, and organization required for injured passengers in case of large-capacity aircraft accidents at airports or in their immediate neighborhood. The probability rates of injured passengers in aircraft accidents are discussed. The possible kinds of injuries are classified in groups according to their severity and treatment required. The medical aid means, both mobile and stationary, are reviewed. The evacuation chain is discussed, and the available local and regional hospital facilities are considered. The medical aid emergency measures at the Orly airport in Paris are demonstrated. O.H.

A69-42603
EVACUATION OF MAXILLA-FACIALLY WOUNDED PERSONS BY AIR (L'EVACUATION DU BLESSE MAXILLO-FACIAL PAR VOIE AERIENNE).
J. Vincent, J. Pons, and J. Bonhours (Ministère des Armées, Hôpitaux des Armées, Paris, France).
Revue de Médecine Aéronautique et Spatiale, vol. 8, 2nd Quarter, 1969, p. 83-86. In French.

Discussion of the air transport of maxilla-facially wounded persons from the place of the accident to the place of medical treatment. Two stages of evacuation by air are considered: (1) primary evacuation from the place of the accident to the first aid center, and (2) secondary evacuation effected from the first aid center to a specialized center. Types of French helicopters convenient for evacuation purposes are reviewed, and the appropriate medical treatment in different cases of maxilla-facial injuries for both stages of evacuation are discussed. O.H.

A69-42604
THE AZZI-DEMANEZ RETARDED VOICE TEST IN THE INVESTIGATION OF RECRUITMENT (TEST DE LA VOIX

RETARDEE D'AZZI-DEMANEZ DANS LES RECHERCHES DE RECRUTEMENT).

A. Hustin (Société Anonyme Belge d'Exploitation de la Navigation Aérienne; Institut Edith Cavell, Brussels, Belgium).

Revue de Médecine Aéronautique et Spatiale, vol. 8, 2nd Quarter, 1969, p. 89-91. In French.

Description of the apparatus for performing retarded voice tests designed by Azzi and Demanez. Graphical recording is used to determine the intensity of deformations provoked by autoaudition. The test procedure is discussed in detail. This method is applied to the investigation of recruitment which, in this manner, can be determined without any error and without the patient's subjective participation. O.H.

A69-42605

INFLUENCE OF ILLUMINATION ON THE READING OF NAVIGATION CHARTS (INFLUENCE DE L'ECLAIRAGE SUR LA LECTURE DES CARTES DE NAVIGATION).

G. Perdriel (Val de Grâce), J. Chevaleraud (Ministère des Armées, Hôpitaux des Armées, Paris, France), and A. Mercier.

Revue de Médecine Aéronautique et Spatiale, vol. 8, 2nd Quarter, 1969, p. 97-102. In French.

Results of a study concerning the effect of illumination on the ease of reading of different air navigation charts during various flight stages. Questionnaires filled in by 45 military and 118 civilian air navigators have been processed, and the respective data obtained are classified in tabular form. The resulting conclusions are discussed. O.H.

A69-42624

CARDIOVASCULAR PERFORMANCE OF ALASKA SLED DOGS DURING EXERCISE.

Robert L. Van Citters (Washington, University, Dept. of Physiology and Biophysics, Seattle, Wash.) and Dean L. Franklin (Scripps Clinic Research Foundation, La Jolla, Calif.).

Circulation Research, vol. 24, Jan. 1969, p. 33-42. 13 refs.

Research supported by the American Heart Association and the Washington State Heart Association; Contract No. AF 41(609)-67-001.

Study of regional blood flow distribution in Alaska sled dogs during cross-country runs. Doppler ultrasonic flowmeter transducers were chronically implanted on the coronary, renal, and mesenteric arteries, terminal abdominal aorta, and ascending aorta or pulmonary artery, while a miniature blood pressure gauge was installed in the aorta or carotid artery. The heart rate, 40 to 60 per min in sleeping dogs, increased to 80 to 100 per min when the dogs were ambulatory and to 100 to 150 per min when the dogs were excited before a race. Heart rate accelerated to 300 per min at the start of exercise and commonly remained at that level throughout prolonged runs. G.R.

A69-42625

CERTAIN HISTOLOGICAL AND CHEMICAL RESPONSES OF THE VASCULAR INTERFACE TO ACUTELY INDUCED MECHANICAL STRESS IN THE AORTA OF THE DOG.

Donald L. Fry (U.S. Public Health Service, National Heart Institute, Cardiology Branch, Bethesda, Md.).

Circulation Research, vol. 24, Jan. 1969, p. 93-108.

Study carried out in order to quantify certain histological and chemical responses of the intimal tissues *in vivo* to acutely induced mechanical stresses. Evans blue dye was given to tag serum albumin, and an artificial fat emulsion was infused so that altered fluxes of either serum proteins or the artificial chylomicrons across the vascular interface into the intimal region could be detected. Special histological and photodensimetric techniques were developed to estimate these fluxes, as well as the architectural changes in the endothelial cell population. Architectural changes were quantified by performing endothelial cell counts to quantify the "normal" and "abnormal" endothelial cell population density as a function of stress exposure. The stress corresponding to the greatest rate of change of normal to abnormal cell forms is defined as the acute critical yield stress and was found to average less than 420 dynes/sq cm. Similarly, the stress at which the greatest number of cells are being eroded is defined as the erosion stress. The flux of Evans blue dye into the intima increased with pressure or wall strain, with shearing stress, and with increased turbulence. The flux of artificial chylomicrons into the intimal region never occurred in the presence of a normal endothelial cell population and was found to be most heavy in areas of total cellular erosion. (Author)

A69-42626

REFLEX REGULATION OF ARTERIAL PRESSURE DURING SLEEP IN MAN—A QUANTITATIVE METHOD OF ASSESSING BAROREFLEX SENSITIVITY.

Harley S. Smyth, Peter Sleight, and George W. Pickering (Radcliffe Infirmary, Cardiac Dept., Oxford, England).

Circulation Research, vol. 24, Jan. 1969, p. 109-121. 35 refs.

Research supported by the Rhodes Trust and the Medical Research Council.

Study of the control of arterial pressure during sleep in 13 untreated, unsedated subjects aged 20 to 46, including seven with hypertension. Arterial pressure was measured directly. A transient rise of arterial pressure up to 30 mm Hg was produced by the sudden intravenous injection of 0.25 to 2 micrograms of angiotensin. Linear plots were obtained in 10 of 13 subjects when the systolic pressures of successive pulses during the pressure rise were plotted against the pulse intervals which began the next beat. The relationship was disturbed by movement or arousal and was better when pulse intervals falling in inspiration were discarded. The slope of the line (milliseconds of cardiac slowing per millimeter rise in systolic pressure) in the awake subject ranged from 2 to 15.5 msec/mm Hg, and from 4.5 to 28.9 during sleep. Reflex sensitivity was highest in dreaming sleep. In seven of 10 subjects, baroreflex sensitivity increased significantly during sleep; in six the prevailing arterial pressure was inversely correlated with the baroreflex sensitivity. The pressure appeared to be the dependent variable. It is concluded that the baroreceptor reflex arc can be rapidly reset, particularly during sleep. The lower arterial pressures during sleep may be actively maintained in some subjects by increased baroreflex sensitivity. (Author)

A69-42627

INTERSTITIAL PRESSURE OF THE LUNG.

Robert B. Mellins, O. Robert Levine, Richard Skalak, and Alfred P. Fishman (Columbia University, New York, N.Y.).

Circulation Research, vol. 24, Feb. 1969, p. 197-212. 30 refs.

Research supported by the New York Heart Association; PHS Grants No. HE-05741; No. HE-08015.

Study of the effects of alveolar and pleural pressures on pulmonary interstitial pressure in 36 anesthetized dogs by application of Starling's law of transcapillary exchange. Fluid accumulation in the lung was produced by increasing left atrial pressure to levels always higher than alveolar pressure and by hemodilution with saline. Using a lung divider, a difference in alveolar pressure of from 5 to 14 mm Hg was achieved between the two sides in 24 dogs. Increased alveolar pressure did not reduce the rate of fluid accumulation, indicating its lack of effect on interstitial pressure. A relationship between the rate of fluid accumulation and the forces in the Starling equation was demonstrated when pleural pressure was included as an index of interstitial pressure. The rate of fluid accumulation increased markedly when interstitial pressure exceeded atmospheric. Fluid accumulation was considerably less in lobes statically inflated with plasma than in contralateral lobes ventilated with air (six dogs); this difference could not be attributed to static inflation as opposed to ventilation (six dogs). These findings suggest that surface tension opposes the transmission of alveolar pressure to the interstitial space.

The interstitial pressure, as measured by application of Starling's law, acts on the small vessels within the alveolar-capillary membrane. (Author)

A69-42628
REFRACTORY PERIOD OF THE DOG'S VENTRICULAR MYOCARDIUM FOLLOWING SUDDEN CHANGES IN FREQUENCY.
M. J. Janse, A. B. M. van der Steen, R. Th. van Dam, and D. Durrer (Amsterdam, University, Dept. of Cardiology and Clinical Physiology, Amsterdam, Netherlands).
Circulation Research, vol. 24, Feb. 1969, p. 251-262. 12 refs.
Research supported by the Netherlands Organization for the Advancement of Pure Research.

In situ investigation of the speed of adaptation of the refractory period to a sudden change of the heart rate in canine hearts. The results indicate that the refractory period changes quickly within the first two beats and then changes more slowly, reaching the steady-state value of the new frequency after a few hundred beats. G.R.

A69-42629 *
RELATIVE ROLES OF SYMPATHETIC AND PARASYMPATHETIC NERVOUS SYSTEMS IN THE CAROTID SINUS REFLEX IN DOGS.
Walter D. Berkowitz, Benjamin J. Scherlag, Emanuel Stein, and Anthony N. Damato (U.S. Public Health Service, Hospital, Cardiopulmonary Laboratory, Staten Island, N.Y.).
Circulation Research, vol. 24, Mar. 1969, p. 447-455. 20 refs.
NASA-PHS-supported research.

Study of the effects of electrical stimulation of the carotid sinus on sinus rate and atrioventricular (A-V) conduction before and after alternate interruption of the vagi and sympathetic nerves to the heart in dogs. In group I, carotid sinus stimulation caused a similar absolute decrease in sinus rate before and after vagotomy, although after vagotomy the response was more latent. Subsequent administration of propranolol blocked the effects of carotid sinus stimulation on sinus rate. In group II (dogs with intact vagi), the effects of carotid sinus stimulation and bilateral occlusion of the common carotid artery on sinus rate were abolished by bilateral stellatectomy and upper thoracic ganglionectomy. In group III, the effects of carotid sinus stimulation on A-V conduction during atrial pacing at a fixed rate were not significantly altered by vagotomy and were blocked by subsequent administration of propranolol. In group IV, carotid sinus stimulation had no effect on A-V conduction after sympathetic denervation. It is concluded that the effects of the carotid sinus reflex on the heart are mediated primarily by the sympathetic nervous system efferents. In addition, evidence suggesting that sympathetic tone is a major determinant of vagal tone has been presented. (Author)

A69-42630
REDUCED CARDIAC MYOSIN ADENOSINETRIPHOSPHATASE ACTIVITY IN DOGS WITH SPONTANEOUSLY OCCURRING HEART FAILURE.
Robert J. Luchi, Eve Marie Kritcher, and Per T. Thyrum (Pennsylvania, University, Hospital, Dept. of Medicine, Philadelphia, Pa.).
Circulation Research, vol. 24, Apr. 1969, p. 513-519. 20 refs.
PHS Grants No. HE-08805; No. HE-06352.

Study of cardiac myosin isolated from the hearts of seven dogs with naturally occurring heart failure. Six of the seven dogs had heart failure secondary to acquired mitral valvular insufficiency; the seventh was believed to have a primary myocardiopathy. The characteristics of this myosin were compared to cardiac myosin from a group of normal dogs studied concurrently. Cardiac myosin was extracted from heart muscle with a phosphate salt solution and purified by repeated fractionation with ammonium sulfate in the presence of 2M lithium chloride. Myosin from dogs with heart failure had a significantly reduced adenosinetriphosphatase activity compared to myosin from the control group. Sulfhydryl group content, shown to influence myosin enzyme activity, was unchanged in myosin from dogs with heart failure. The molecular weight of myosin was similar in both groups. The sedimentation velocity of myosin from dogs with heart failure was suggestive of a configurational change in the molecule, but this was not confirmed by measurement of the intrinsic viscosity and helical content of the protein. These studies suggested that the reduced contractile performance of the myocardium in congestive heart failure complicating a disease process is, in part at least, the result of depressed myosin adenosinetriphosphatase activity. (Author)

A69-42631
EFFECTS OF ALTERED LOADING ON CONTRACTILE EVENTS IN ISOLATED CAT PAPILLARY MUSCLE.
William W. Parmley, Dirk L. Brutsaert, and Edmund H. Sonnenblick (Peter Bent Brigham Hospital, Cardiovascular Unit; Harvard University, Harvard Medical School, Boston, Mass.).
Circulation Research, vol. 24, Apr. 1969, p. 521-532. 15 refs.
Research supported by the American Heart Association; PHS Grant No. HE-11306-01.

Study in which the mode of contraction of the cat papillary muscle was changed abruptly from isotonic to isometric, showing that the tension of the first isometric contraction is as much as 22 per cent greater and lasts substantially longer than the subsequent stable isometric contractions attained after a few beats. This previously undescribed phenomenon is largely independent of preload or inotropic influences, but is greatly diminished at lower temperatures. Force-velocity curves equivalent to the first isometric contraction revealed a maximum velocity of shortening 9.5 plus or minus 2.0 per cent greater than that of the stable isometric contraction. Thus apparent changes in muscle contractility can occur whenever there are sudden substantial changes in tension development. This effect may be due to transitory changes in free intracellular calcium or, alternatively, to the presence of a viscous element in close association with the contractile element. (Author)

A69-42632
DYNAMIC CHARACTERISTICS OF THE CARDIOVASCULAR AUTONOMIC EFFECTS DURING SEVERE ARTERIAL HYPOXIA IN THE UNANESTHETIZED RABBIT.
Paul I. Korner and John B. Uther (Royal Prince Alfred Hospital, Hallstrom Institute of Cardiology; Sydney, University, Dept. of Medicine, Sydney, Australia).
Circulation Research, vol. 24, May 1969, p. 671-687. 45 refs.
Research supported by the National Heart Foundation of Australia, the Life Insurance Medical Research Fund of Australia and New Zealand, and the National Health and Medical Research Council.

Assessment of the autonomic reflex effects due to inhalation of low concentrations of oxygen in unanesthetized rabbits from the differences in the responses of normal and autonomically "deefferented" rabbits, on the one hand, and rabbits with a selective effector block, on the other. The different combinations of early and late components shown by the four autonomic effector patterns established by the study are discussed. The early effects resulted in the reduction of the cardiac output and a major redistribution of the peripheral blood flow, while the cardiac output rose and the blood flow was redistributed further during the late phase. V.Z.

A69-42633
HUMAN CARDIOVASCULAR ADJUSTMENTS TO RAPID CHANGES IN SKIN TEMPERATURE DURING EXERCISE.
Loring B. Rowell, John A. Murray, George L. Brengelmann, and Kenneth K. Kraning, II (Washington, University, Dept. of Medicine, Dept. of Physiology, and Dept. of Biophysics, Seattle, Wash.).
Circulation Research, vol. 24, May 1969, p. 711-724. 20 refs.

PHS Grant No. HE-09773; NIH Grant No. FR-37.

Measurement of the central circulatory responses of a group of 11 normal men performing continuous exercises during which their skin temperature was varied between 26.9 and 38.2 deg C with the aid of a special water-perfused garment. The changes in cardiac output, heart rate, stroke volume, central blood volume, aortic mean pressure, right atrial mean pressure, and total peripheral resistance during the experiments are discussed. All variables returned to control levels when the skin temperature was reduced toward 26.9 deg C after rising to 38.2 deg C. V.Z.

A69-42634

INCREASED MYOCARDIAL OXYGEN CONSUMPTION AND CONTRACTILE STATE ASSOCIATED WITH INCREASED HEART RATE IN DOGS.

Robert C. Boerth, James W. Covell, Peter E. Pool, and John Ross, Jr. (U.S. Public Health Service, National Heart Institute, Cardiology Branch, Bethesda, Md.).

Circulation Research, vol. 24, May 1969, p. 725-734. 33 refs.

Examination of the effects of increasing the frequency of contraction on myocardial oxygen consumption per minute in eight dogs using an isovolumic left ventricular preparation. Myocardial oxygen consumption was determined at two to four levels of heart rate in each animal. Peak wall stress was maintained constant in each animal so that changes in it would not influence the effects of heart rate on oxygen consumption per beat. As heart rate was increased, there was a highly significant linear increase in myocardial oxygen consumption. Oxygen consumption per beat was shown to be a negative linear function of the reciprocal of heart rate. Thus, as heart rate increased, there was a significant increase in oxygen consumption per beat; when basal oxygen consumption was subtracted from total oxygen consumption, there was a much larger increase in oxygen consumption per beat. Myocardial contractile state, defined as the maximum observed contractile element velocity at the lowest common level of wall stress, was significantly increased by increasing heart rate. The data suggest that the increased myocardial oxygen consumption associated with augmented heart rate is secondary to augmentation of contractile state, as well as to the increase in stress development per minute. (Author)

A69-42635

CENTRAL NERVOUS INTEGRATION OF THE CIRCULATORY AND RESPIRATORY RESPONSES TO ARTERIAL HYPOXEMIA IN THE RABBIT.

Paul I. Korner, John B. Uther, and Saxon W. White (Royal Prince Alfred Hospital, Hallstrom Institute of Cardiology; Sydney, University, Dept. of Medicine, Sydney, Australia).

Circulation Research, vol. 24, June 1969, p. 757-776. 53 refs.
Research supported by the National Heart Foundation of Australia, the Life Insurance Medical Research Fund of Australia and New Zealand, and the National Health and Medical Research Council.

Study of neural integration during arterial hypoxia in sham-operated, rhinencephalic, thalamic, high mesencephalic, and pontine rabbits, three hours after operation under halothane anesthesia. All preparations except the pontine recovered normal movement and posture 40 to 60 min after the operation, and effects on the resting circulation specifically ascribable to transection were small. Activation of diencephalic, and to a lesser extent of rhinencephalic, centers was necessary to produce the large increase in autonomic peripheral resistance effect and the autonomic slowing of heart rate characteristic of normal rabbits. In animals with only pontine and high mesencephalic centers, the autonomic peripheral resistance effect was smaller and there was an autonomic rise in heart rate. The neocortex and rhinencephalon exerted inhibitory influences related to the effects of hyperventilation. Suprabulbar respiratory mechanisms were also activated during hypoxia, with diencephalic mechanisms limiting to reflex response mediated by the pontine centers and the cortex exerting disinhibitory effects on the diencephalic centers. The cardiorespiratory response at different degrees of hypoxia probably depends on differences in relative magnitude of inputs from the arterial chemoreceptors, baroreceptors, and lung inflation receptors, producing different degrees of excitation and inhibition of the various suprabulbar and bulbar centers. (Author)

A69-42636

CHANGES IN THE ACTIVITIES OF LYSOSOMAL ENZYMES IN INFARCTED CANINE HEART MUSCLE.

Kurt G. Ravens and S. Gudbjarnason (Wayne State University, School of Medicine, Dept. of Medicine, Detroit, Mich.).

Circulation Research, vol. 24, June 1969, p. 851-856. 22 refs.
Research supported by the American Medical Association Education and Research Foundation, the Michigan Heart Association, and the Detroit General Hospital Research Corp.; PHS Grant No. HE-05043.

Experimental myocardial infarction was produced in 32 mongrel dogs. The changes in activity of four lysosomal enzymes (acid phosphatase, glucuronidase, deoxyribonuclease, and gamma-glutamyl-transpeptidase) were examined in the soluble and the particle-bound fraction. The pattern of changes in free and particle-bound enzyme activity observed was similar for all four enzymes. During the first 48 hours after coronary occlusion, the particle-bound enzyme activity was decreased, while the free activity was moderately increased, reflecting the autolytic phase of cell and tissue destruction. Between the second and the sixth day, the soluble hydrolytic enzyme activity was maximal and the particle-bound activity was slowly increasing. During this period, the main part of tissue degradation and removal of cell debris takes place. Ten days after myocardial infarction, the free hydrolytic activity had returned to control values, but the particle-bound enzyme activity was four to ten times higher in the infarcted tissue than in the control muscle. (Author)

A69-42637

THE MYOCARDIUM IN HYPERFUNCTION, HYPERTROPHY AND HEART FAILURE.

Felix Z. Meerson (Academy of Medical Sciences, Institute of Normal and Pathological Physiology, Moscow, USSR).

Circulation Research, vol. 25, July 1969, Supplement no. 2. 169 p. 436 refs. Translation.

Review of the current state of knowledge concerning the myocardial metabolism, and physiology and pathophysiology of the heart. The contractile function of the heart in hyperfunction, hypertrophy, and heart failure are described. The transformation of the energy in the myocardium in hyperfunction, hypertrophy, and heart failure is examined. A study is made of the dynamics of nucleic acid and protein synthesis in the myocardium in hyperfunction and hypertrophy. Replication, transcription, and translation in the myocardium in compensatory hyperfunction and heart failure are outlined. The role of structural proteins in the myocardial structure in hyperfunction, hypertrophy, and heart failure is examined. The effect of cofactors of protein synthesis and precursors of nucleic acid on the development of cardiac hyperfunction and failure is studied. Z.W.

A69-42638

PROPAGATION OF BLOOD FLOW PULSE IN THE NORMAL HUMAN PULMONARY ARTERIAL SYSTEM.

Nicholas B. Karatzas and Grant de J. Lee (Oxford University, Dept. of Medicine; Radcliffe Infirmary, Oxford, England).

Circulation Research, vol. 25, July 1969, p. 11-21. 25 refs.
Research supported by the British Heart Foundation; Contract No. AF 61(052)-746.

Investigation of some dynamic events associated with the pulsatile flow of blood in the pulmonary arterial system of six healthy men in the supine position. The nitrous oxide/body plethysmograph method was used to record the pulmonary capillary blood flow pulse, while a phonocardiogram was used to determine the time of opening and closing of the pulmonary valve. The pattern

of right ventricular ejection was modified by administration of atropine and isoproterenol and by exercise. The time of conduction of the flow pulse from the pulmonary valve to the lung capillaries averaged 120 msec. Acceleration of capillary blood during systole averaged 8.2 ml/sec/msec. The fraction of stroke volume which distended the pulmonary arterial system during systole averaged 67.2 per cent. The peak flow rate averaged 186 ml/sec. It was found that isoproterenol and exercise resulted in an increase in average capillary blood acceleration. P.G.

A69-42639
INPUT-OUTPUT ANALYSIS FOR TOTAL INPUT RATE AND TOTAL TRACED MASS OF BODY CHOLESTEROL IN MAN.
William Perl and Paul Samuel (Goldwater Memorial Hospital, Cardiorespiratory Research Laboratory and New York University Research Service, New York; Long Island Jewish Hospital, Jamaica, N.Y.).
Circulation Research, vol. 25, Aug. 1969, p. 191-199. 32 refs.
Research supported by the Nassau Heart Association and the Health Research Council of the City of New York; PHS Grants No. HE-07482; No. HE-07188.

Generalization of the Stewart-Hamilton theorems for flow and volume to yield total input rate and total traced mass in multiple-input, steady-state systems with partially labeled input. Application is made to existing decay curves of tracer cholesterol in human serum measured under a control steady state and again under a steady state of neomycin administration which lowered the serum cholesterol level. The effect of neomycin on the total traced mass of body cholesterol was to reduce it by 38, 40, 32, and 24 g, corresponding to 34, 40, 25, and 33 per cent, in four patients studied. The present analysis utilizes only the area and the first time moment of the plasma decay curve. It is applicable to decay curves of more general shape than those that can be fitted by a small number of exponentials. The analysis does not require the assumption of compartments. (Author)

A69-42644
ELECTROPHYSIOLOGY OF THE HUMAN VISUAL SYSTEM.
John C. Armington (Northeastern University, Dept. of Psychology, Boston, Mass.).
(American Academy of Occupational Medicine, Annual Meeting, 21st, Boston, Mass., Feb. 5-7, 1969.)
Archives of Environmental Health, vol. 19, Oct. 1969, p. 598-604. 22 refs.
Contract No. DA-49-193-MD-2978.

Review of the properties of two response potentials, the electroretinogram and the visually evoked cortical potential. A brief description of the methods for recording these two potentials is presented. Special attention is given to an advanced method of electroretinography using a contact lens electrode and to modern computer response averaging procedures which make it possible to overcome the signal-to-noise problem. The information that can be obtained from these potentials is outlined, and the use of this information in clinical situations is discussed. Z.W.

A69-42700
EFFECTS OF POLYURETHANE FOAMS ON MICROBIAL GROWTH IN FUEL-WATER SYSTEMS.
J. J. Cooney (Dayton, University, Dept. of Biology, Dayton, Ohio).
Applied Microbiology, vol. 17, Feb. 1969, p. 227-231. 20 refs.
Research supported by the Firestone Coated Fabrics Co.

Investigation of four open-cell, ester-base polyurethane foams for their effect on growth of fuel-utilizing organisms in jet fuel-water systems. Three foams contained a potential biocide, tetraethylthiuram E (0.66 per cent), sodium omadine (0.07 per cent), or zinc omadine (0.07 per cent). These were compared with a control foam without additive. Each foam was examined in fuel-water systems containing JP-4 fuel, JP-4 fuel plus 0.1 per cent anti-icing additive (AIA), or JP-5 fuel. Pure cultures of a fuel-grown bacterium, *Pseudomonas aeruginosa*, and of a fuel-grown fungus, *Hormodendrum (Cladosporium)* sp., served as test organisms. In the three fuel systems examined, tetraethylthiuram E- and sodium omadine-containing foams are found to have little effect on the growth of the bacterium; foam with zinc omadine decreased the rate of bacterial growth but had little effect on the total population. Tetraethylthiuram E decreased the rate of fungal growth and showed its greatest effect in JP-4 plus AIA. P.G.

A69-42701
CIRCADIAN RHYTHMS IN NONHUMAN PRIMATES; INTERNATIONAL CONGRESS OF PRIMATOLOGY, 2ND, SYMPOSIUM, EMORY UNIVERSITY, ATLANTA, GA., JULY 2, 1968, PROCEEDINGS.
Edited by F. H. Rohles (Kansas State University of Agriculture and Applied Science, Institute for Environmental Research, Manhattan, Kan.).
Basel, Switzerland, S. Karger AG (Bibliotheca Primatologica, No. 9), 1969. 136 p.
$7.90.

CONTENTS:

A69-42702
ILLUMINATION INTENSITY AND BEHAVIORAL CIRCADIAN RHYTHMS.
D. N. Farrer and J. W. Ternes (USAF, Systems Command, Aeromedical Research Laboratory, Holloman AFB, N.Mex.).
IN: CIRCADIAN RHYTHMS IN NONHUMAN PRIMATES; INTERNATIONAL CONGRESS OF PRIMATOLOGY, 2ND, SYMPOSIUM, EMORY UNIVERSITY, ATLANTA, GA., JULY 2, 1968, PROCEEDINGS. (A69-42701 24-04)

Edited by F. H. Rohles.
Basel, Switzerland, S. Karger AG (Bibliotheca Primatologica, No. 9), 1969, p. 1-7. 7 refs.

Study of the effects of intensity of constant illumination upon fixed-ratio lever-pressing behavior for appetitive reinforcement with the chimpanzee in a temperature- and humidity-controlled environment. A chimpanzee was trained to perform a simple behavioral task to obtain food and water while confined to a controlled temperature and relative humidity environment for long periods of isolation. Following this period of stabilization, a 28-day experiment was conducted in which two levels of illumination (1 lux for the first 14 days and 85 lux for the last 14 days) were sequentially studied. Lever-pressing behavior for food and water was measured during each 15-minute period of this study, and the resultant spontaneous frequency for the free-running work-rest rhythm was plotted in histogram form. The statistical treatment of these data indicated the circadian rhythm was 23.8 hr during the 1-lux condition of the first two weeks, and 25.1 hr during the 85-lux condition of the last two weeks. These data provide evidence of circadian frequencies in operant behavior which are modifiable by the amount of illumination in the controlled environment. G.R.

A69-42703 *
CENTRAL NERVOUS, CARDIOVASCULAR AND METABOLIC DATA OF A MACACA NEMESTRINA DURING A 30-DAY EXPERIMENT.
T. Hoshizaki, W. R. Adey, J. P. Meehan, D. O. Walter, J. I. Berkhout, and E. Campeau (California, University, Brain Research Institute, Space Biology Laboratory, Los Angeles, Calif.).
IN: CIRCADIAN RHYTHMS IN NONHUMAN PRIMATES; INTERNATIONAL CONGRESS OF PRIMATOLOGY, 2ND, SYMPOSIUM, EMORY UNIVERSITY, ATLANTA, GA., JULY 2, 1968, PROCEEDINGS. (A69-42701 24-04)
Edited by F. H. Rohles.
Basel, Switzerland, S. Karger AG (Bibliotheca Primatologica, No. 9), 1969, p. 8-38. 11 refs.
Contract no. NAS 2-2503.

Discussion of the results of the first full simulation of a 30-day Biosatellite flight which served as a long-duration compatibility test between a *Macaca nemestrina* monkey and the spacecraft. Data acquisition systems were tested, and initial ground-based data were obtained. The EEG patterns and cardiovascular and metabolic responses of the monkey were studied. Body movements, perception, recent memory, and hand-eye coordination were also studied. The results obtained indicate a clear diurnal pattern in many of the parameters that were measured. It is pointed out that the environment imposed upon the animal had within it a strict 24-hr rhythmicity. G.R.

A69-42704
SOCIAL ENTRAINMENT OF BIORHYTHMS IN RHESUS MONKEYS.
F. H. Rohles and G. Osbaldiston (Kansas State University of Agriculture and Applied Science, Manhattan, Kan.).
IN: CIRCADIAN RHYTHMS IN NONHUMAN PRIMATES; INTERNATIONAL CONGRESS OF PRIMATOLOGY, 2ND, SYMPOSIUM, EMORY UNIVERSITY, ATLANTA, GA., JULY 2, 1968, PROCEEDINGS. (A69-42701 24-04)
Edited by F. H. Rohles.
Basel, Switzerland, S. Karger AG (Bibliotheca Primatologica, No. 9), 1969, p. 39-51. 8 refs.
Contract No. AF 44(620)-68-C-0020.

Study of the social entrainment of feeding rhythms in laboratory monkeys when light and temperature, as well as sound, were held constant. Two monkeys, who were trained to press a lever 35 times any time they desired food, were placed into isolation for 45 days. During this period each animal developed its own feeding rhythm. The animals were then placed so they could see and hear each other for 30 days, and during this period the feeding rhythm of both animals coincided. During a third period when the animals were again isolated, the feeding rhythm of one subject was changed, whereas the other was unaffected. Since light and temperature were held constant, it was concluded that social entrainment was responsible for altering the feeding rhythm. This alteration was also accompanied by a substantial increase in urinary excretion and 17-hydroxicorticosteroid output, but other urinary constituents were unchanged. G.R.

A69-42705 *
A BIGEMINUS PATTERN IN SOCIAL BEHAVIOR.
J. S. Thach, Jr. (U.S. Navy, Naval Aerospace Medical Institute, Pensacola, Fla.).
IN: CIRCADIAN RHYTHMS IN NONHUMAN PRIMATES; INTERNATIONAL CONGRESS OF PRIMATOLOGY, 2ND, SYMPOSIUM, EMORY UNIVERSITY, ATLANTA, GA., JULY 2, 1968, PROCEEDINGS. (A69-42701 24-04)
Edited by F. H. Rohles.
Basel, Switzerland, S. Karger AG (Bibliotheca Primatologica, No. 9), 1969, p. 52-63. 30 refs.
NASA-sponsored research.

Investigation of social behavior of two preadolescent baboons (*Papio papio*), a male and a female. A free-access experiment established these baboons' continuance of a particular coherent pattern of 24-hr periodicity in social behavior, revealed in field studies under laboratory conditions in continuous light, thereby suggesting the operation of rather basic endogenous factors not requiring light cycling in the determination of a subhuman primate's behavior pattern. The deprivation experiment showed this pattern to be relatively independent of social deprivation and any particular relationship to eating or drinking. Therefore the morning-afternoon difference cannot be explained simply by an overnight recovery from habituation hypothesis or by association with, or facilitation by, food and water. G.R.

A69-42706 *
PHASE RELATIONSHIPS BETWEEN CIRCADIAN RHYTHMS AND PHOTOPERIODISM IN THE MONKEY.
C. M. Winget (NASA, Ames Research Center, Environmental Biology Div., Moffett Field, Calif.), D. F. Rahlmann, and N. Pace (California, University, Dept. of Physiology, Berkeley, Calif.).
IN: CIRCADIAN RHYTHMS IN NONHUMAN PRIMATES; INTERNATIONAL CONGRESS OF PRIMATOLOGY, 2ND, SYMPOSIUM, EMORY UNIVERSITY, ATLANTA, GA., JULY 2, 1968, PROCEEDINGS. (A69-42701 24-04)
Edited by F. H. Rohles.
Basel, Switzerland, S. Karger AG (Bibliotheca Primatologica, No. 9), 1969, p. 64-74. 12 refs.

Study of the phase relationships of circadian rhythms of heart rate, locomotor activity, and deep body temperature (DBT) in unrestrained *Cebus albifrons* and *Macaca nemestrina* in response to photoperiods of various lengths. The primates were maintained unrestrained for relatively long periods (as long as 18 months). For each experiment, the animals were placed in individual cages in a relatively constant environment. The circadian rhythm of DBT was determined by hermetically sealed miniature radio transmitters implanted retroperitoneally on the right side of the abdominal cavity. Although the results do not indicate which physiological mechanisms are responsible for the circadian rhythms of DBT, locomotor activity, and heart rate in the nonhuman primates, they do show that the relationships involved are nonlinear. G.R.

A69-42707 *
CIRCADIAN VARIATIONS OF PHYSIOLOGICAL VARIABLES IN ISOLATED AND NON-ISOLATED MACACA NEMESTRINA.
R. E. Smith (California, University, Dept. of Human Physiology, Davis, Calif.) and D. R. Wekstein (Kentucky, University, Dept. of Physiology and Biophysics, Lexington, Ky.).

IN: CIRCADIAN RHYTHMS IN NONHUMAN PRIMATES; INTERNATIONAL CONGRESS OF PRIMATOLOGY, 2ND, SYMPOSIUM, EMORY UNIVERSITY, ATLANTA, GA., JULY 2, 1968, PROCEEDINGS. (A69-42701 24-04)
Edited by F. H. Rohles.
Basel, Switzerland, S. Karger AG (Bibliotheca Primatologica, No. 9), 1969, p. 75-90. 23 refs.
Grants No. NGR-18-001-008; No. NGR-05-004-038.

Investigation of physiological circadian rhythms in isolated and nonisolated *Macaca nemestrina* for periods up to 100 days in duration. Telemetered deep body temperatures, together with urine volume, urinary sodium, potassium, total catecholamines, and 17-ketogenic steroids have been obtained in monkeys living with a normal photoperiod and under conditions of constant light at different intensities. Nonisolated monkeys showed circadian temperature rhythms of varying form and variability, but all peaking in the late afternoon. Their urinary rhythms varied in peak phase, generally showing maxima earlier in the day than do their human counterparts. Monkeys isolated in dim light generally showed a shortening of both temperature and urinary rhythms. G.R.

A69-42708
BIOLOGIC RHYTHM CORRELATES OF DISTURBED BEHAVIOR IN THE RHESUS MONKEY.
C. F. Stroebel (Institute of Living Hospital, Experimental Psychophysiology Laboratories, Hartford, Conn.).
IN: CIRCADIAN RHYTHMS IN NONHUMAN PRIMATES; INTERNATIONAL CONGRESS OF PRIMATOLOGY, 2ND, SYMPOSIUM, EMORY UNIVERSITY, ATLANTA, GA., JULY 2, 1968, PROCEEDINGS. (A69-42701 24-04)
Edited by F. H. Rohles.
Basel, Switzerland, S. Karger AG (Bibliotheca Primatologica, No. 9), 1969, p. 91-105. 18 refs.
Research supported by the Gengras Foundation; NIH Grant No. MH-08552.

Discussion of preliminary findings of abnormal biologic rhythms associated with disturbed behavior in rhesus monkeys in the laboratory. While attempting to replicate rodent studies reported by Stroebel (1967) with rhesus monkeys, two subjects were observed that developed predominantly 48-hr periodicities as measured by brain temperature sensed with a surgically implanted extradural thermistor. It is hypothesized that behavioral stress, as opposed to physical stress, might be the important factor in producing these abnormal rhythms. In the experiments conducted two patterns of biologic rhythm abnormality associated with disturbed behavior could be produced with a behavioral stress situation. G.R.

A69-42709 *
CIRCADIAN SYSTEM OF NONHUMAN PRIMATES—SUMMARY OF A SYMPOSIUM IN 1968 AND OF SOME EARLIER WORK.
F. Halberg (Minnesota, University, Dept. of Pathology, Chronobiology Laboratories, Minneapolis, Minn.).
IN: CIRCADIAN RHYTHMS IN NONHUMAN PRIMATES; INTERNATIONAL CONGRESS OF PRIMATOLOGY, 2ND, SYMPOSIUM, EMORY UNIVERSITY, ATLANTA, GA., JULY 2, 1968, PROCEEDINGS. (A69-42701 24-04)
Edited by F. H. Rohles.
Basel, Switzerland, S. Karger AG (Bibliotheca Primatologica, No. 9), 1969, p. 106-127. 30 refs.
PHS Grant No. 5-K6-GM-13,981; Contracts No. NAS 2-2738; No. AF 29(600)-69-C-0011; Grant No. NGR-24-005-006.

Review of some of the results in the field of nonhuman primate rhythms in order to document two important points. These points are that circadian rhythm parameters can be rigorously estimated in nonhuman primates, as well as in other species, and that such objective, quantitative relativized parameters are of interest both to basic and to applied biomedical science. On the basic side, a microscopic analysis of some of the data published about half a century ago by Simpson and Galbraith (1905-1906) on the phase-shifting characteristics of the simian circadian system reveals a polarity that can be discerned by the circumstance that, following a 90-deg phase shift carried out as an advance, the number of transient cycles may differ from that following a phase shift of rhythm carried out as a delay. On the applied side, it is found that, once their parameters can be rigorously assessed by the procedures outlined, prominent and ubiquitous circadian and other rhythms provide new endpoints for pharmacologists and toxicologists. G.R.

A69-42724
HISTOLOGY OF PAPILLARY MUSCLES OF THE LEFT VENTRICLE IN MYOCARDIAL INFARCTION.
Frank R. Brand, Arnold L. Brown, Jr., and Kenneth G. Berge (Mayo Clinic and Mayo Foundation; Minnesota, University, Mayo Graduate School of Medicine, Rochester, Minn.).
(American Heart Association, Meeting, San Francisco, Calif., Oct. 20-24, 1967.)
American Heart Journal, vol. 77, Jan. 1969, p. 26-32. 11 refs.

Evaluation of histological patterns of fibrosis of the left ventricular papillary muscles from comparisons of a series of hearts with evidence of myocardial infarction to appropriate controls without evidence of myocardial lesions. A study of the histology of papillary muscles in a consecutive autopsy series of cases of acute and healed myocardial infarction revealed frequent fibrosis of these structures. Two patterns of fibrosis were identified. One, termed "focal," was interpreted as a healed acute papillary muscle infarction. The other, termed "diffuse," was associated with disease of the small vessels. The prevalence of acute infarction of these structures in hearts with both acute and healed mural lesions was 14 per cent. When only hearts with acute mural lesions were considered, the prevalence of acute papillary muscle infarction was 33 per cent. P.G.

A69-42725
BLOOD RHEOLOGY IN PATHOGENESIS OF THE CORONARY HEART DISEASES.
Leopold Dintenfass (Sydney, University, Sydney Hospital and Dept. of Medicine, Sydney, Australia).
American Heart Journal, vol. 77, Jan. 1969, p. 139-147. 31 refs.
Research supported by the National Heart Foundation of Australia.

Investigation of the viscosity of blood as a possible key factor in the physiology and pathology of circulation. It is noted that blood viscosity is effected not only by the flow velocity but also by the quantitative aspects of its subphases—i.e., hematocrit, aggregation of the red cells, the internal viscosity of the red cells, and plasma viscosity. It is concluded that myocardial infarction and coronary occlusion might be nonspecific diseases of a multitude of etiologies but characterized by a common single pathway of the blood high-viscosity syndrome. P.G.

A69-42726
THE SECOND HEART SOUND IN CORONARY ARTERY DISEASE—A PHONOCARDIOGRAPHIC ASSESSMENT.
Walter H. Caulfield, Jr., Roger H. Smith, and Robert B. Franklin (Letterman General Hospital, Dept. of Medicine, Div. of Cardiology; U.S. Army, Medical Research Unit, San Francisco, Calif.).
American Heart Journal, vol. 77, Feb. 1969, p. 187-191. 8 refs.

Analysis of the frequency of paradoxical splitting of the second sound in patients with coronary disease by means of phonocardiography. The second heart sound is assessed clinically and by phonocardiography in twenty patients with coronary artery disease. Phonocardiography revealed normal splitting in all twenty subjects, and illustrated the need for a reference (indirect carotid pulse), in the assessment of the second heart sound. Z.W.

A69-42727
ABNORMAL MITRAL VALVE MOTION AS DEMONSTRATED

BY THE ULTRASOUND TECHNIQUE IN APPARENT PURE MITRAL INSUFFICIENCY.

William L. Winters, Jr., Louis A. Soloff (Temple University, Medical Center, Dept. of Medicine, Philadelphia, Pa.), and Jesse Hafer, Jr.

American Heart Journal, vol. 77, Feb. 1969, p. 196-205. 19 refs.
NIH Grant No. HE-06313.

Study of the mitral valve motion by the reflected ultrasound technique in twenty-four patients with clinically pure mitral regurgitation. It is found that an abnormally slow ultrasound diastolic slope may be due not only to mitral stenosis but also to structural alteration of the mitral valve apparatus which produces pure mitral regurgitation or high-grade mitral regurgitation with minimal or mild mitral stenosis. Diminished amplitude of excursion is related to increasing calcification regardless of whether the lesion is regurgitation or stenosis. It would therefore appear that correct interpretations of an abnormally slow ultrasound diastolic slope depends on a correlation with other clinical technical findings. Z.W.

A69-42728

QUANTITATIVE STUDIES ON THE ERRORS OF THE PULSE, WHEN USED TO ESTIMATE CARDIAC FUNCTION. I, II.

Isaac Starr (Pennsylvania, University, School of Medicine, Dept. of Therapeutic Research, Philadelphia, Pa.).

American Heart Journal, vol. 77, Feb. 1969, p. 222-236. 27 refs.
NIH Grant No. H-625.

Determination of the errors of the pulse occurring between heart and aorta and during pulse transmission when the pulse is used to estimate the cardiac function. Quantitative studies of the pulse-heart relationship were performed on fresh cadavers in which systole was simulated at necropsy. The results obtained permit a comparison between differences of cardiac strength and the resulting aortic pulse amplitude. In another series of experiments simultaneous records of the same pulse wave were made by two optical manometers, one recording from the ascending aorta, and the other from the femoral artery. The data obtained are analyzed to define the errors to which a doctor attempting to judge cardiac function from the peripheral pulse would be subject. It is concluded that when the cardiac strength is estimated from peripheral pulse pressure, or by palpation of the peripheral pulse, the errors involved are much larger than is commonly believed. Z.W.

A69-42729

INCIDENCE AND MANAGEMENT OF SUPRAVENTRICULAR ARRHYTHMIAS AFTER ACUTE MYOCARDIAL INFARCTION.

D. E. Jewitt, R. Balcon, E. B. Raftery, and S. Oram (King's College Hospital, Cardiac Dept., London, England).

American Heart Journal, vol. 77, Feb. 1969, p. 290-293. 15 refs.

Description of experience gained in the management of supraventricular arrhythmias after acute myocardial infarction, with particular reference to the value of dc reversion. Observation of a total of 222 patients with proved recent myocardial infarcts are described. It is considered that early dc shock with low-energy discharges was particularly beneficial in patients with persistent atrial tachycardia or flutter. In contrast, digitalization remains the treatment of choice in patients with sustained atrial fibrillation. Z.W.

A69-42751

FEEDBACK EFFECTS AND SOCIAL FACILITATION OF VIGILANCE PERFORMANCE—MERE COACTION VERSUS POTENTIAL EVALUATION.

Eric Klinger (Minnesota, University, Morris, Minn.).

Psychonomic Science, vol. 14, Feb. 25, 1969, p. 161, 162. 10 refs.
NSF Grant No. GS-1346.

Description of audiometric room experiments performed on a group of 24 pairs of male subjects instructed to report brighter-than-usual flashes of light on a screen while in visual contact with each other, but otherwise not communicating. The performance of the subjects was found to be improved in the presence of a coactor, when the coactor had access to information concerning the quality of the performance. V.Z.

A69-42752

VISUAL AND TACTUAL INTERACTION IN JUDGMENTS OF THE VERTICAL.

Gary Kress and John Cross (St. Louis University, St. Louis, Mo.).

Psychonomic Science, vol. 14, Feb. 25, 1969, p. 165, 166. 6 refs.

Description of dark-room experiments on groups of four male subjects who were instructed to set a comparison bar to the apparent vertical while receiving either vertical or nonvertical reference information in an apparatus consisting of a rectangular box enclosing two luminous pivoted wooden rods 8 in. apart at their centers and mounted at eye level. Two intermodal and two intramodal conditions were used. The visual settings were significantly more accurate than tactual settings, regardless of the reference modality used. The visual reference significantly increased the error of the tactual setting over a setting using a tactual reference. The differences between the performances of the groups were not statistically significant. V.Z.

A69-42783

A DIGITAL COMPUTER MODEL OF THE EFFECTS OF GRAVITATIONAL STRESS UPON THE HEART AND VENOUS SYSTEM.

C. J. Dickinson (London, University, University College Hospital, Medical School, London, England).

Medical and Biological Engineering, vol. 7, May 1969, p. 267-275.

Description of a digital computer model to study the effects of head-up and head-down tilt upon the heart and venous system. The venous system is treated as a series of segments of equal length, one of which is taken to be the right atrium. Provision is made for segmental capacitances to be individually adjusted, to allow realistic blood distributions to be studied. The program calculates expected volumes, pressures, and flows in each segment under different conditions of tilt, thus allowing prediction of the point in the system at which pressure changes least with body tilting. (Author)

A69-42784

A SIMPLE MATHEMATICAL DERIVATION OF THE STEWART-HAMILTON FORMULA FOR THE DETERMINATION OF CARDIAC OUTPUT.

M. E. Valentinuzzi, L. A. Geddes, and L. E. Baker (Baylor University, College of Medicine, Dept. of Physiology, Houston, Tex.).

Medical and Biological Engineering, vol. 7, May 1969, p. 277-282. 11 refs.

Derivation of the Stewart-Hamilton formula applicable to all the most common cardiac output measurement techniques and to the determination of regional blood flow. It is found that after the injection of an indicator—either in a peripheral vein, the left ventricle, or the right ventricle—the area under a dilution curve recorded at any point downstream is always the same regardless of the selected vessel. This property permits the application of the Stewart-Hamilton formula for the calculation of blood flow. P.G.

A69-42818 #

MINIMIZATION OF TRAINING COST AND QUANTITY OF MULTI-SKILLED PERSONNEL WHEN REQUIREMENTS ARE UNCERTAIN.

Kenneth W. Haynam (U.S. Army, Behavioral Science Research Laboratory).

American Astronautical Society and Operations Research Society of America, Joint National Meeting, Denver, Colo., June 17-20, 1969, AAS Paper 69-116. 22 p.

Description of an algorithm which minimizes both the quantity of personnel and the training costs necessary to meet skill requirements which are uncertain. The algorithm is applicable when personnel may be given training in one or more skills and the requirements are for single skills. Given n contingencies in terms of the required number of men in each of m skills, the algorithm calculates the optimum mix of personnel with multiple and single skills to satisfy skill requirements completely no matter which contingency is realized. The solution algorithm was developed to calculate the optimum training composition of a contingency force of Army aviators. (Author)

A69-42841 #
ORBITAL EVA.
Kenneth Sheffield.
American Astronautical Society and Operations Research Society of America, Joint National Meeting, Denver, Colo., June 17-20, 1969, AAS Paper 69-517. 9 p.

Examination of the problems associated with EVA, and survey of the associated technology up to and including the planned Apollo Applications Program EVAs. The EVA tasks planned for the future, the problems they generate, and the solutions proposed are presented. (Author)

A69-42843 #
PERCEPTION OF LASER LIGHT.
Carl F. Asiala, Jr. (McDonnell Douglas Corp., McDonnell Douglas Astronautics Co., Eastern Div., St. Louis, Mo.).
American Astronautical Society and Operations Research Society of America, Joint National Meeting, Denver, Colo., June 17-20, 1969, AAS Paper 69-464. 13 p. 15 refs.

The uniqueness of the laser centers on the differences between observations using coherent and noncoherent light. The only area of major difference is that of the granularity associated with a coherent light observation. Only a limited subjective impression can be stated for the effect of granularity on the observer. Many observers have indicated that their ability to concentrate on an image which possesses sparkle is considerably impaired. This research is the first known attempt to move from the subjective impression to a numerical expression of a difference, if it exists, between coherent and noncoherent sources. This research assesses the effects of the laser granularity phenomenon on brightness discrimination. Utilizing the psychophysical method of limits, varying shades of gray stimuli were presented to subjects under white, noncoherent red, and helium-neon laser light conditions. (Author)

A69-42845 #
GRAVITY-INDEPENDENT LIQUID COLLECTION AND FLUID PHASE-SEPARATION SYSTEM.
William E. James and Donald J. Holecek (Martin Marietta Corp., Denver, Colo.).
American Astronautical Society and Operations Research Society of America, Joint National Meeting, Denver, Colo., June 17-20, 1969, AAS Paper 69-473. 10 p.

Description of a separation system which can be used during space missions to collect wash and waste water from a gaseous environment and to separate its liquid and gaseous phases. The separation system consists of a blower, venturi, separator, retention tank, and miscellaneous valves and fittings. It is unique in that the only moving part in the entire system is the vacuum blower, which is used to provide a suction at the liquid collection head and to induce a differential pressure across the hydrophilic screen in the separator. The operating principle of the separator is also unique; centrifugal force and a hydrophilic screen are used to separate the liquid from the gas. (Author)

A69-42846 #
EVA STABILIZATION SHOES.
Edwin H. Wrench and Arthur L. Greensite (General Dynamics Corp., Convair Div., San Diego, Calif.).
American Astronautical Society and Operations Research Society of America, Joint National Meeting, Denver, Colo., June 17-20, 1969, AAS Paper 69-472. 24 p.

Examination of the concept of employing a two-degree-of-freedom control moment gyro for attitude control of an astronaut during extravehicular activity. Shoe-mounted tilts, controlled by muscle action about the ankles, are envisioned. The precessional feedback forces are applied to the foot for tactile rate sensing. Preliminary evaluation indicates that two shoes, weighing five pounds each, and a two-hour battery supply, weighing four pounds, will permit tumble sensing and three-axis maneuvers at reasonable rates. Equations of motion are derived and evaluated for simplified small angle precession. (Author)

A69-42847 #
AN APPROACH FOR THE IMPROVEMENT OF EVA/IVA FLUID UMBILICAL CHARACTERISTICS.
Donald A. Myers and Harold J. Richter (Martin Marietta Corp., Denver Div., Denver, Colo.).
American Astronautical Society and Operations Research Society of America, Joint National Meeting, Denver, Colo., June 17-20, 1969, AAS Paper 69-470. 6 p.

The stowage and handling of EVA/IVA umbilicals present a formidable operational problem and impose a severe mobility constraint on the astronaut. Results are given of a Martin Marietta Corporation internal research and development program during which a promising approach for improving both umbilical flexibility and stowability was developed and tested. (Author)

A69-42848 * #
PROBLEMS OF ABORT FROM MANNED SPACECRAFT.
Arthur L. Greensite (General Dynamics Corp., Convair Div., San Diego, Calif.).
American Astronautical Society and Operations Research Society of America, Joint National Meeting, Denver, Colo., June 17-20, 1969, AAS Paper 69-469. 69 p. 25 refs.
Contract No. NAS 8-21383.

Discussion of the problem of ensuring crew survival under emergency situations that may arise during various phases of manned space flight. The problem is examined from a unified point of view, focusing attention primarily on the nature of different abort modes and the various emergency situations common to a variety of missions. Current conceptual philosophies are reviewed, and trends in future space missions are examined in terms of abort requirements on the pad, in the atmosphere (especially the high q region), beyond the atmosphere, in earth orbits, and in lunar environment. The refinements of the Apollo abort system in regard to that of Gemini are described. V.P.

A69-42850 * #
EVA MANEUVERING UNIT COMPARISON.
Allwin E. Wudell, William H. Tobey (Martin Marietta Corp., Space Operations Section, Research Dept., Denver, Colo.), and C. E. Whitsett, Jr. (NASA, Manned Spacecraft Center, Houston, Tex.).
American Astronautical Society and Operations Research Society of America, Joint National Meeting, Denver, Colo., June 17-20, 1969, AAS Paper 69-516. 46 p.
Contracts No. AF 33(615)-68-C-1175; No. NAS 9-9109.

Description of two studies on the comparison, through simulation, of three maneuvering units for space tasks. The maneuvering units considered are: (1) an unstabilized astronaut maneuvering unit (AMU), (2) a hand-held maneuvering unit (HHMU), and (3) an

integrated maneuvering and life support system (IMLSS). The test subject was suspended in the gimbaled head of the six-degree-of-freedom servo-driven moving-base simulator. The simulation technique involves computation of the problem dynamics on a hybrid computer that then determines the commands for the moving base. Instrument maneuvering unit hand controller mockups are used by the test subject. Signals from the hand controller mockups are used in the hybrid program to introduce the thrust histories. The performance comparison data for the AMU and HHMU, as well as for four configurations of the IMLSS, are established. Z.W.

A69-42876 * #
RECENT ADVANCES IN CLOSED LIFE SUPPORT SYSTEM CONCEPTS.
Jacob Shapira (NASA, Ames Research Center, Biotechnology Div., Moffett Field, Calif.).
American Astronautical Society and Operations Research Society of America, Joint National Meeting, Denver, Colo., June 17-20, 1969, AAS Paper 69-143. 12 p. 23 refs.

The logistics of long duration manned space missions demands that effective systems be developed for the recovery of useful materials from metabolic and other wastes. The order of priority is water, oxygen, and food. The current state of development is also in the same order. This work discusses those approaches to these problems which are currently under most intensive investigation in this country. Water is most conveniently recovered by a combination of vacuum distillation and multifiltration. Carbon dioxide is removed by absorption and is subsequently reduced to methane with hydrogen to produce additional water. Oxygen can be produced from water by electrolysis of recovered liquid water or directly from the vapor phase. Bioregenerative food systems may have utility, but physicochemical methods appear to offer many advantages. (Author)

A69-42888 *
PRODUCTION OF INTERFERON IN MICE—EFFECT OF ALTERED GASEOUS ENVIRONMENTS.
Kun-Yen Huang and Francis B. Gordon (National Naval Medical Center, Naval Medical Research Institute, Dept. of Microbiology, Bethesda, Md.).
Applied Microbiology, vol. 16, Oct. 1968, p. 1551-1556. 23 refs.
NASA-supported research.

Study of the effects of altered gaseous environments (parabarosis) on interferon production in mice, with Newcastle disease virus (NDV) as the inducer. Results indicate that, in mice injected intravenously with NDV, hypoxia enhances interferon levels as determined by assay of perfused lungs but not by assay of serum. Hyperoxia, unlike hypoxia, did not exert any significant effect on interferon level as observed in sera and in lungs. F.R.L.

A69-42904 *
URINE SOLUTE COMPOSITION OF RATS EXPOSED TO CHRONIC CENTRIFUGATION.
Howard H. Bengele and Charles C. Wunder (Iowa, University, College of Medicine, Dept. of Physiology and Biophysics, Iowa City, Iowa).
Society for Experimental Biology and Medicine, Proceedings, vol. 130, Jan. 1969, p. 219-223. 6 refs.
NIH Grant No. GM-10093; Grant No. NGR-16-001-031.

Discussion of experiments which show that the urine osmolality of chronically centrifuged rats is reduced below that of either the ad libitum fed or the pair-fed control animals. This dilution is not accompanied by an increased excretion in the quantity of osmotically-effective solutes. These alterations, accompanied by an increased urine output, indicate an enhanced free water excretion thus implying the involvement of the antidiuretic hormone in the observed centrifugation polyuria. G.R.

A69-42909
PATTERN RECOGNITION AND A MODEL OF THE BRAIN.
J. J. Sparkes (Essex, University, Dept. of Electrical Engineering Science, Colchester, Essex, England).
International Journal of Man-Machine Studies, vol. 1, July 1969, p. 263-278. 5 refs.

Consideration of the principal functions which characterize brain-like behavior—namely, pattern recognition, pattern synthesis, memory, and learning. It is tentatively concluded that the brain can usefully be regarded as a pattern recognition machine. The primary features of the pattern recognition process—namely, the concept of similarity, the use of context and the need for iterative signal analysis—are discussed. Finally, a model of a simple speech recognition machine which incorporates those aspects of brain processes which are relevant to such a machine is proposed. (Author)

A69-42910 *
A MODEL OF THE VERTEBRATE CENTRAL COMMAND SYSTEM.
W. L. Kilmer (Michigan State University, East Lansing, Mich.), W. S. McCulloch, and J. Blum (Massachusetts Institute of Technology, Cambridge, Mass.).
International Journal of Man-Machine Studies, vol. 1, July 1969, p. 279-309. 32 refs.
NIH Grant No. 5 ROI NB-04985-06; Contracts No. NSR-22-009-138; No. AF 33(615)-3885; Grants No. NGR-22-009-140; No. AF AFOSR 1023-67.

Description of S-RETIC, a computer simulation model which caricatures the reticular formation Golgi anatomy of Scheibel and Scheibel (1958, 1967). The model consists of a dozen probabilistic hybrid computer modules linked together with jumpers of different lengths to form an anastomotic array. This array is neither serial nor parallel. An enhanced S-RETIC, STC-RETIC, has also been simulated, and in addition to rolling from mode to mode as a proper function of its 84 binary inputs, it is capable of habituation, conditioning, extinction, generalization, and limited trial-and-error discrimination. An enriched version of STC-RETIC is discussed which is designed to operate asynchronously and show appropriate endogenously influenced behavior. The place of a reticular formation model in the functional organization of a complete android robot is outlined. (Author)

A69-42947 #
DEPENDENCE OF PHARMACOLOGICAL EFFECTS ON THE NOISE LEVEL (ZUR ABHÄNGIGKEIT PHARMAKOLOGISCHER EFFEKTE VOM GERÄUSCHPEGEL).
K. Hecht, K. Treptow, and Tamara Hecht (Deutsche Akademie der Wissenschaften, Institut für kortiko-viszerale Pathologie und Therapie, Berlin, East Germany).
Acta Biologica et Medica Germanica, vol. 23, no. 1, 1969, p. 121-132. 28 refs. In German.

Study of the influence of different noise levels under constant conditions on the effectiveness of centrally acting drugs, using escape conditioning. Sixty five- to six-month old albino rats were used for the experiments. Caffeine, ethyl-crotyl-barbiturate, and benactyzine proved to be extremely noise-labile drugs, whereas chlorpromazine and reserpine were stable against the noise situation. The results are compared with findings of other investigators, and their importance for medical practice is discussed. P.G.

A69-42948 #
CORRELATIONS BETWEEN THE NOISE LEVEL AND CONDITIONED REFLEX PERFORMANCE (WECHSELBEZIEHUNGEN ZWISCHEN GERÄUSCHPEGEL UND BEDINGT-REFLEKTORISCHEM LEISTUNGSVERMÖGEN).

K. Hecht, K. Treptow, and Tamara Hecht (Deutsche Akademie der Wissenschaften, Institut für kortiko-viszerale Pathologie und Therapie, Berlin, East Germany).
Acta Biologica et Medica Germanica, vol. 23, no. 1, 1969, p. 133-143. 30 refs. In German.

Investigation of the influence of continuous noise levels of about 30 phons (normal situation) or 80 phons with frequencies between 100 and 2000 Hz (noise) on stabilized escape conditioning in male albino rats. It is generally noticed that the conditioning performance under continuous noise level (80 phons) is higher than under silent conditions. The results show that acoustic pulses from the surroundings may have not only a disturbing effect but also an activating effect on the central nervous system. P.G.

A69-42983 * #
A MULTIPURPOSE VENTRICULAR ACTUATING SYSTEM.
John A. Webb, Jr. and Vernon D. Gebben (NASA, Lewis Research Center, Cleveland, Ohio).
International Federation for Medical and Biological Engineering, International Conference on Medical and Biological Engineering, 8th, and Annual Conference on Engineering in Medicine and Biology, 22nd, Chicago, Ill., July 19-25, 1969, Paper. 11 p.

Description of the design of a pneumatic driving system for heart assist or total heart replacement pumps. The system provides square pressure waveforms to drive the heart assist and uses feedback control to regulate a total heart replacement pump. A pneumatic square wave generator was developed to serve as a flexible tool for studying various cardiac assist techniques. This generator can be synchronized with the natural heart using the R-wave of the electrocardiogram as a trigger. The addition of feedback control to regulate a total heart replacement is discussed and data are given. (Author)

A69-42996 #
POSSIBLE BIOLOGICAL AND PHYSIOPATHOLOGICAL EFFECTS OF THE UHF ELECTROMAGNETIC RADIATION OF RADAR ANTENNAS (EFFETS BIOLOGIQUES ET PHYSIOPATHOLOGIQUES EVENTUELS DES RAYONNEMENTS ELECTROMAGNETIQUES U.H.F. DES "AERIENS-RADARS").
R. Joly, G. Plurien, J. Drouet, and B. Servantie (Ministère des Armées, Service de Santé, Paris, France).
Revue des Corps de Santé des Armées, vol. 10, June 1969, p. 239-259. 65 refs. In French.

Discussion of the biological and physiopathological effects of uhf radar radiation on personnel working with radar antennas. The exposure time, the amount of body surface exposed to radiation, and the quantity of absorbed energy are considered. The objective consequences of thermal effects are considered, as well as those of effects not obviously thermal. Localized effects on the head, eyes, genitals, and endocrine glands are reviewed. A large number of experiments on animals is described. It is concluded that attention should be paid to measures for protecting personnel exposed to uhf radiation, and general recommendations are outlined. P.G.

A69-43014
INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS AND ERGONOMICS RESEARCH SOCIETY, INTERNATIONAL SYMPOSIUM ON MAN-MACHINE SYSTEMS, ST. JOHN'S COLLEGE, CAMBRIDGE, ENGLAND, SEPTEMBER 8-12, 1969, PROCEEDINGS.
Ergonomics, vol. 12, July 1969. 198 p.

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PREFACE. D. Whitfield (Aston, University, Birmingham, England). 1 p.

MAN-COMPUTER INTERACTION—THE CONTRIBUTION OF THE HUMAN SCIENCES. B. Shackel (EMI Electronics, Ltd., Feltham, Middx., England), p. 485-499. 36 refs. (See A69-43015 24-05)

MAN-COMPUTER INTERACTION—A CHALLENGE FOR HUMAN FACTORS RESEARCH. R. S. Nickerson (Bolt Beranek and Newman, Inc., Cambridge, Mass.), p. 501-517. 50 refs. (See A69-43016 24-05)

DISPLAY DESIGN—PRINCIPLES AND PROCEDURES. W. T. Singleton (Aston, University, Birmingham, England), p. 519-531. 28 refs. (See A69-43017 24-05)

THE USE OF MULTI-MAN SYSTEM TRAINERS. G. G. Jeantheau (Dunlap and Associates, Inc., Darien, Conn.), p. 533-542.

AIDING THE DECISION MAKER—A DECISION PROCESS MODEL. L. P. Schrenk (Honeywell, Inc., Minneapolis, Minn.), p. 543-557. 67 refs. (See A69-43018 24-05)

ARCHETYPES IN MAN-COMPUTER PROBLEM SOLVING. R. B. Miller (International Business Machines Corp., Poughkeepsie, N.Y.), p. 559-581. 12 refs. (See A69-43019 24-05)

DEVELOPMENTS IN SELECTION AND TRAINING. K. W. Tilley (Royal Air Force, Brampton, Hunts., England), p. 583-597. 15 refs. (See A69-43020 24-05)

THEORY OF MANUAL VEHICULAR CONTROL. D. McRuer and D. H. Weir (Systems Technology, Inc., Hawthorne, Calif.), p. 599-633. 167 refs. (See A69-43021 24-05)

ON ADAPTIVE MANUAL CONTROL. L. R. Young (Massachusetts Institute of Technology, Cambridge, Mass.), p. 635-674. 42 refs. (See A69-43022 24-05)

BIAS IN EXPERIMENTAL COMPARISONS BETWEEN EQUIPMENTS DUE TO THE ORDER OF TESTING. E. C. Poulton (Medical Research Council, Cambridge, England), p. 675-687. 16 refs. (See A69-43023 24-05)

A69-43015
MAN-COMPUTER INTERACTION—THE CONTRIBUTION OF THE HUMAN SCIENCES.
B. Shackel (EMI Electronics Ltd., Ergonomics Laboratory, Feltham, Middx., England).
(Institute of Electrical and Electronics Engineers and Ergonomics Research Society, International Symposium on Man-Machine Systems, St. John's College, Cambridge, England, Sept. 8-12, 1969.) Ergonomics, vol. 12, July 1969, p. 485-499. 36 refs.

Analysis of the possible contribution of the human sciences to man-computer interaction, based upon a full review of the relevant human factors literature. A possible taxonomy for the field is proposed, founded on broad divisions of the human sciences problem areas and of the types of computer systems and services. Using the taxonomy as a framework, some examples of relevant human sciences work and some problems and research needs are discussed. (Author)

A69-43016
MAN-COMPUTER INTERACTION—A CHALLENGE FOR HUMAN FACTORS RESEARCH.
R. S. Nickerson (Bolt Beranek and Newman, Inc., Cambridge, Mass.).
(Institute of Electrical and Electronics Engineers and Ergonomics Research Society, International Symposium on Man-Machine Systems, St. John's College, Cambridge, England, Sept. 8-12, 1969.) Ergonomics, vol. 12, July 1969, p. 501-517. 50 refs.
Contract No. AF 19(628)-68-C-0125.

It is shown that the increasing heterogeneity of the community of computer users poses a challenge to psychologists and human factors researchers. Reasons why this challenge apparently has not yet evoked a strong response are examined. Three problems, or problem areas, are identified as being particularly in need of human factors research. These are (1) the development and evaluation of conversational languages, (2) the determination of how the use patterns adopted by users depend on system characteristics, and (3) the description, or modeling, of man-computer interaction. (Author)

A69-43017
DISPLAY DESIGN—PRINCIPLES AND PROCEDURES.
W. T. Singleton (Aston, University, Birmingham, England).

(Institute of Electrical and Electronics Engineers and Ergonomics Research Society, International Symposium on Man-Machine Systems, St. John's College, Cambridge, England, Sept. 8-12, 1969.) Ergonomics, vol. 12, July 1969, p. 519-531. 28 refs.

Review of research on display design, and discussion of the general problems of real/artificial displays and new/stored information, with particular emphasis on compatibility. The main discussion centers on the advantages and limitations of the three general approaches to display design: use of checklists, use of formal procedures, and use of behavior theory. A checklist for display design is provided, and the other procedures are illustrated by case studies. (Author)

A69-43018
AIDING THE DECISION MAKER—A DECISION PROCESS MODEL.
L. P. Schrenk (Honeywell, Inc., Systems and Research Center, Minneapolis, Minn.).
(Institute of Electrical and Electronics Engineers and Ergonomics Research Society, International Symposium on Man-Machine Systems, St. John's College, Cambridge, England, Sept. 8-12, 1969.) Ergonomics, vol. 12, July 1969, p. 543-557. 67 refs.

Description of a tentative, conceptual model of an idealized process of decision making. The model is based on both empirical and theoretical research and contains phases of problem recognition, problem diagnosis, and action selection. The model is intended primarily to provide (1) a guide to system designers in structuring decision tasks and (2) a framework for organizing knowledge about decision-making behavior. This model may also provide a basis for task allocation, for specifying requirements for aids to operator decision making, and for guiding further research by highlighting gaps in knowledge. The design of the decision tasks can be determined when the nature of the expected decisions is defined and the information needed to make the decisions is specified. P.G.

A69-43019
ARCHETYPES IN MAN-COMPUTER PROBLEM SOLVING.
R. B. Miller (International Business Machines Corp., Systems Development Div., Poughkeepsie, N.Y.).
(Institute of Electrical and Electronics Engineers and Ergonomics Research Society, International Symposium on Man-Machine Systems, St. John's College, Cambridge, England, Sept. 8-12, 1969.) Ergonomics, vol. 12, July 1969, p. 559-581. 12 refs.

Discussion of eight basic task archetypes involved in man-computer problem solving. These comprise the categories of simple inquiry, status briefing and exception detection, diagnosis, planning, choosing alternatives, evaluating and optimizing, constructing and designing, and discovery. It is noted that category discipline does not only enable the bounding and structuring of an information content of a data-based information system, but also provides a way of linking the operations and purposes of various human tasks to the sets, subsets, names, and logical orderings in the data base. It is stressed that the eight task archetypes proposed are not mutually exclusive either psychologically or mechanically. The advantages of this system are shown, and it is noted that it points the way to a compact man-machine task language that can be simple, precise according to human intent, and general. P.G.

A69-43020
DEVELOPMENTS IN SELECTION AND TRAINING.
K. W. Tilley (Royal Air Force, Training Command, Brampton, Hunts., England).
(Institute of Electrical and Electronics Engineers and Ergonomics Research Society, International Symposium on Man-Machine Systems, St. John's College, Cambridge, England, Sept. 8-12, 1969.) Ergonomics, vol. 12, July 1969, p. 583-597. 15 refs.

Following a brief outline of the characteristic features of the systems approach to training, the information-processing model is identified as a particularly illuminating approach to job classification. It is argued that the model highlights the multidimensional nature of task difficulty, indicates appropriate training methods, and provides a language for describing any human skill. The problem of deriving a meaningful classification of cognitive skills is discussed, and it is suggested that higher-order mental processes can be broken down into four distinguishable stages, each with its own potential sources of difficulty. The implications of the systems approach for selection are then considered, and it is argued that there is a need for increased flexibility and sophistication in diagnostic testing. Finally, examples drawn from recent studies conducted within the Royal Air Force are adduced to illustrate the kinds of improvement in performance which can be achieved through the application of a systems approach to training. (Author)

A69-43021
THEORY OF MANUAL VEHICULAR CONTROL.
D. McRuer and D. H. Weir (Systems Technology, Inc., Hawthorne, Calif.).
(Institute of Electrical and Electronics Engineers and Ergonomics Research Society, International Symposium on Man-Machine Systems, St. John's College, Cambridge, England, Sept. 8-12, 1969.) Ergonomics, vol. 12, July 1969, p. 599-633. 167 refs.

The analytical basis of manual vehicular control theory is a combination of feedback systems analysis and mathematical models for human operators engaged in control tasks. Simplified representations for the operator-system combination are provided by the "crossover model," which is described in detail. The system dynamics and average performance of the crossover model system are developed. With these as bases, case studies are presented to illustrate the types of results which can be obtained from application of the operator-vehicle control theory. Two aircraft control examples illustrate the use of the theory and its empirical correlates to estimate operator dynamic characteristics, system performance, pilot ratings, pilot commentary, design implications, and some experimental guidelines. A driver-automobile example is presented to illustrate the use of the theory in structuring the key guidance and control features of the driver's visual field. (Author)

A69-43022 *
ON ADAPTIVE MANUAL CONTROL.
L. R. Young (Massachusetts Institute of Technology, Cambridge, Mass.).
(Institute of Electrical and Electronics Engineers and Ergonomics Research Society, International Symposium on Man-Machine Systems, St. John's College, Cambridge, England, Sept. 8-12, 1969.) Ergonomics, vol. 12, July 1969, p. 635-674. 42 refs.
Grant No. NGR-22-009-225.

Examination of the rapid variation of human control as determined by at least four adaptive systems: the input adaptation, controlled element adaptation, task adaptation, and programmed adaptation. Input adaptation and prediction refer to man's ability to detect familiar or repeated patterns in the input and to track these in a predictive or open loop fashion. The controlled element adaptation is defined as the ability of men to adapt different control strategies appropriate to changing dynamics of the system being controlled. The transient aspects of this process are shown to be of particular interest and are examined in detail. Task adaptation encompasses the complex matter of optimization of the manual control loop. It is shown how the human changes his strategy, for the same input and controlled elements, depending on the relative penalties associated with system error, vehicle acceleration, time to reach a terminal state, or control effort. The role of programmed adaptation is mentioned, and the limits of controllability are considered. Various models for manual adaptive control are illustrated. P.G.

A69-43023
BIAS IN EXPERIMENTAL COMPARISONS BETWEEN EQUIPMENTS DUE TO THE ORDER OF TESTING.
E. C. Poulton (Medical Research Council, Applied Psychology Unit, Cambridge, England).
(Institute of Electrical and Electronics Engineers and Ergonomics Research Society, International Symposium on Man-Machine Systems, St. John's College, Cambridge, England, Sept. 8-12, 1969.) Ergonomics, vol. 12, July 1969, p. 675-687. 16 refs.
Research supported by the Medical Research Council.

Ergonomic study of the design of experimental tests comparing the efficiency of equipments with that of man, and analysis of the possible defects in the experimental design. It is emphasized that tests comparing equipments should use separate groups of people for each equipment, because if the same people work with all the equipments in balanced orders, the results of the tests may be biased by hidden transfer effects. This point is illustrated by two sets of experiments. The first set compared true motion displays with relative motion displays. It is shown that, although true motion displays are always preferable to relative displays, three experiments found a relative motion display reliably better than a true motion display under certain conditions; this may be due to confusion by the participants in the experiments of the various optimal phase relationships existing . between control movements and display movements. The second set of experiments compared various orders of control using a true motion display. The results show that although a position control system is more compatible with a true motion display than any higher order of control system, one experiment found rate and rate-aided control systems reliably better than a position control system, probably due to confusion between the various optimal phase relationships. It is stressed that, if it is worth running an experimental test to compare alternative designs of equipment, it is worth using a separate group design; a balanced treatment design can bias the experimental results and give an incorrect order of difficulty. O.H.

A69-43025
PRELIMINARY DATA ON A LIMITATION OF THE USE OF AN OXYGEN-HYDROGEN MIXTURE FOR DEEP SUBMERSION TO THE SATURATION POINT (PREMIERES DONNEES SUR UNE LIMITATION DE L'UTILISATION DU MELANGE OXYGENE-HYDROGENE POUR LA PLONGEE PROFONDE A SATURATION).
Alex Michaud, Jean Parc, Lucien Barthelemy, Jacques Le Chuiton, Jacques Corriol, Jacques Chouteau, and Francis Le Boucher (Aix-Marseille, Université, Faculté de Médecine and Laboratoire de Physiologie Appliquée, Marseille; Laboratoire de Physiologie, Groupe d'Etudes et Recherches Sous-marines, Toulon Naval, Var, France).
Académie des Sciences (Paris), Comptes Rendus, Série D—Sciences Naturelles, vol. 269, no. 4, July 28, 1969, p. 497-499. 13 refs. In French.

Investigation of the effect of prolonged deep submersion of test animals in water in a mixed oxygen-hydrogen atmosphere at elevated pressure. An experiment is described in which test rabbits with implanted EEG and EKG electrodes were submerged in a 40-liter caisson 6 m deep in sea water, breathing an oxygen-hydrogen atmosphere and subjected to an environmental pressure of 29 bars (280 m fictitious altitude). The test procedure used is described in detail. The experimental results indicated a progressive decrease in the EEG and EKG activities of the animals with time, ultimately resulting in their death after a period of 15 to 45 hr. The reasons for these results are discussed. O.H.

A69-43059
SELECTED RISK FACTORS IN CORONARY DISEASE.
Jerome Cornfield (Pittsburgh, University, Graduate School of Public Health, Pittsburgh, Pa.) and Shiela Mitchell (U.S. Public Health Service, National Institutes of Health, National Heart Institute, Bethesda, Md.).
(Association of Teachers of Preventive Medicine, Detroit, Mich., Nov. 10, 1968.)
Archives of Environmental Health, vol. 19, Sept. 1969, p. 382-391; Discussion, p. 392-394. 32 refs.
PHS Grant No. GM-15004.

Discussion of the effect of selected risk factors in coronary diseases and of the reasons for the existing lack of a certain basis for computing the magnitude of the mortality reduction that might be achieved. The most important specific factors based on previous investigations regarding the origin of coronary diseases are reviewed and summarized. These factors involve primarily environmental aspects, serum cholesterol content, systolic blood pressure, relative weight, and cigarette smoking. The possibility of tests designed to influence coronary heart diseases by modifying known risk factors is discussed. Present-day methods are criticized for failing to provide secure bases for estimating the mortality reduction currently achievable. The principles which must be observed in future studies if more nearly definitive knowledge is to be forthcoming are indicated. O.H.

A69-43094 #
OPTIMIZATION OF A VISCOELASTIC STRUCTURE—THE SEAT-BELT PROBLEM.
W. Nachbar (California, University, Dept. of the Aerospace and Mechanical Engineering Sciences, La Jolla, Calif.) and J. B. Schipmölder.
American Society of Mechanical Engineers, Applied Mechanics Western Conference, Albuquerque, N.Mex., Aug. 25-27, 1969, Paper 69-APMW-25. 8 p. 8 refs.
Members, $0.75; nonmembers, $1.50.
Contract No. N 00014-67-A-0109-0003.

Optimization of the parameters of elementary linear viscoelastic models is considered for the design of a lap seat belt in automobiles. The vehicle is assumed to stop abruptly on impact. The parameters are optimized to allow the speed of the vehicle before impact to have the largest permissible value consistent with constraints imposed for the safety of the user of the belt. The constraints chosen here are: (1) the maximum displacement of the body after impact is equal to or less than a prescribed critical displacement; (2) the forward speed of the body at the critical displacement does not exceed a prescribed maximum value; and (3) the force exerted by the belt on the body during the motion following impact does not exceed a prescribed maximum value. It is found that the optimized Kelvin-Voigt viscoelastic model is nearly 40 per cent more effective than the purely elastic material. It is nearly as effective as constant deceleration. An additional and advantageous property is proposed, moreover, for belts of viscoelastic materials. This is that the material should have a relatively low spring rate at relatively small strain rates. The optimized belts for the elementary viscoelastic models are shown to be quite stiff at low strain rates, however. (Author)

A69-43108 #
PERISTALTIC WAVES IN CIRCULAR CYLINDRICAL TUBES.
Y. C. Fung (California, University, Dept. of the Aerospace and Mechanical Engineering Sciences, La Jolla, Calif.) and F. Yin.
American Society of Mechanical Engineers, Applied Mechanics Western Conference, Albuquerque, N. Mex., Aug. 25-27, 1969, Paper 69-APMW-3. 9 p. 11 refs.
Members, $0.75; nonmembers, $1.50.
Contract No. AF 44(620)-68-C-0010.

Analysis of peristaltic pumping in a circular cylindrical tube. The problem is a viscous fluid flow induced by an axisymmetric traveling sinusoidal wave of moderate amplitude imposed on the wall of a flexible tube. A perturbation method of solution is sought. The amplitude ratio (wave amplitude/tube radius) is chosen as a parameter. The nonlinear convective acceleration terms in the Navier-Stokes equation are retained. The governing equations are developed up to the second order in the amplitude ratio. The zeroth-order terms yield the classical Poiseuille flow, the first-order

terms yield the Sommerfeld-Orr equation. If there is no pressure gradient in the absence of wall motion, the mean flow and mean pressure gradient (averaged over time) are both shown to be proportional to the square of the amplitude ratio. Numerical results are obtained for this simple case by approximating a complicated group of products of Bessel functions by a polynomial. The results show that the mean axial velocity is dominated by two terms. One term corresponds to a parabolic profile which is due to the mean pressure gradient set up by the wall motion. The other term arises from satisfying the no-slip boundary condition at the wavy wall rather than at the mean position of the wall. In addition, there are perturbations arising from the convective acceleration. If the mean pressure gradient set up by the wall motion itself reaches a certain positive critical value, the velocity becomes zero on the axis. Values of the mean pressure gradient larger than the critical value will induce backward flow in the fluid. Values of the critical pressure gradient for several cases are presented. (Author)

A69-43116
PERCEPTION OF INTERPOLATED POSITION AND ORIENTATION BY VISION AND ACTIVE TOUCH.
Susan J. Lederman and M. M. Taylor (Defence Research Board, Defence Research Establishment, Toronto, Canada).
Perception and Psychophysics, vol. 6, no. 3, 1969, p. 153-159. 18 refs.

Study of perception of interpolated position and orientation by vision and active touch based on three experiments. The three experiments on interpolation are described in detail, and the respective results obtained are discussed and summarized. It is shown that, in general, active touch gives results similar to those found for vision. The consistent differences between both modes of perception are analyzed. O.H.

A69-43117
VARIATION OF THE MAGNITUDE OF THE HORIZONTAL-VERTICAL ILLUSION WITH RETINAL ECCENTRICITY.
Douglas Pearce (Defence Research Board, Defence Research Establishment, Toronto, Canada) and Leonard Matin (Columbia University, New York, N.Y.).
Perception and Psychophysics, vol. 6, no. 4, 1969, p. 241-243. 7 refs.
NSF Grants No. GB-18120; No. GB-5947-01; PHS Grant No. 1-R01-NB-07547.

Study of the horizontal-vertical illusion as a function of retinal eccentricity. It is found that the relation of illusion magnitude to vertical eccentricity is described by a U-shaped function with large amounts of reversed illusion for the more eccentric positions. Substantial effects due to horizontal eccentricity were also obtained, but these were not consistent across subjects. It is suggested that the flattening of the peripheral zones of the refracting surfaces of the eye may be involved in the variation of the illusion with retinal position, and that the astigmatic properties of the central portions of these surfaces may be a prime factor in the usual horizontal-vertical illusion. (Author)

A69-43118
EFFECT OF HEAD MOVEMENT IN VISUAL-KINESTHETIC LOCALIZATION.
A. V. Churchill (Defence Research Board, Defence Research Establishment, Toronto, Canada).
Perceptual and Motor Skills, vol. 28, 1969, p. 785, 786.

Study designed to provide a measure of the effect of head movement on the accuracy of visual and kinesthetic localization. The procedure of this experiment, complementing a similar earlier one, is described in detail. The results indicate that subjects tested perform equally well under the "free head" and "fixed head" conditions of visual-kinesthetic localization which were investigated. O.H.

A69-43136
MECHANISM OF NITRATE REDUCTION IN CHLORELLA.
W. G. Zumft (Sevilla, Universidad, Instituto de Biologia Celular, Seville, Spain; Erlangen-Nürnberg, Universität, Botanisches Institut, Erlangen, West Germany), A. Paneque, P. J. Aparicio, and M. Losada (Sevilla, Universidad, Instituto de Biologia Celular, Seville, Spain).
Biochemical and Biophysical Research Communications, vol. 36, Sept. 10, 1969, p. 980-986. 16 refs.
Research supported by the Sociedad Española Lepetit.

Attempt to ascertain the mechanism of the reduction of nitrate to nitrite and of nitrite to ammonia by two independent enzymes purified from *Chlorella* cells. The methods used for the examinations are briefly described. The results indicate that in this alga the enzyme involved in the first step of nitrate to nitrite reduction is essentially similar to that occurring in higher plants and apparently differs from that found in the blue-green alga *Anabaena cylindrica* by Hattori and Myers (1967). O.H.

A69-43198
ATTENTION SHIFTS IN A MAINTAINED DISCRIMINATION.
Donald S. Blough (Brown University, Dept. of Psychology, Providence, R.I.).
Science, vol. 166, Oct. 3, 1969, p. 125, 126. 5 refs.
PHS Grant No. MH-02456.

Study of pigeons who received lights of varying wavelengths paired with sounds of varying frequencies, with pecking being reinforced only at one stimulus combination. Either the light or the sound was held constant at its reinforced value, while the other stimulus continued to vary. Subsequent tests showed that the constant stimulus had lost much of its control over the birds' responses. (Author)

A69-43201
EFFECTS OF NITROGEN LIMITATION ON THE GROWTH AND COMPOSITION OF UNICELLULAR ALGAE IN CONTINUOUS CULTURE.
B. Richardson, D. M. Orcutt, H. A. Schwertner, Cara L. Martinez, and Hazel E. Wickline (USAF, School of Aerospace Medicine, Aerospace Medical Div., Brooks AFB, Tex.).
Applied Microbiology, vol. 18, Aug. 1969, p. 245-250. 19 refs.

Study of the growth and composition of continuous *Chlorella sorokiniana* and *Oocystis polymorpha* cultures grown on nutrient media with nitrogen concentrations varied from 20 to 3 mmol/liter in a gradual cyclic process. A decrease in the cellular nitrogen content from 10 to 3 per cent accompanied by a sharp reduction of oxygen evolution, carbon dioxide intake, chlorophyll content, and tissue production could be achieved in batch-cultured algae cells by limiting the nitrogen supply. It is concluded that the lipid synthesis in the cells begins to increase noticeably only after their nitrogen content is reduced to about 3 per cent of dry weight. V.Z.

A69-43221 *
EARLY PRE-CAMBRIAN ONVERWACHT MICROSTRUCTURES—POSSIBLY THE OLDEST FOSSILS ON EARTH?
Bartholomew Nagy and Lois Anne Nagy (Arizona, University, Dept. of Geochronology, Tucson, Ariz.).
Nature, vol. 223, Sept. 20, 1969, p. 1226-1229. 26 refs.
NASA-supported research.

Study of microstructures found in early Precambrian sedimentary rocks of the Onverwacht Series of South Africa. These microstructures were studied both in petrographic thin sections and in powdered preparations from eleven sedimentary zones along the Onverwacht stratigraphic column. Polymeric organic matter was detected in the rocks by gas chromatography. It is noted that the microstructures show some resemblance to very simple organisms, but their morphology is poor and their size range is very great. P.G.

A69-43225
DENATURATION OF DNA AT pH 7·0 BY ACID AND ALKALI.
Elliott L. Uhlenhopp and Alvin I. Krasna (Columbia University, College of Physicians and Surgeons, Dept. of Biochemistry, New York, N.Y.).
Nature, vol. 223, Sept. 20, 1969, p. 1267-1269. 7 refs.
AEC-NSF-supported research.

Investigation of the influence of alkali and acid on a calf thymus DNA solution. A denaturation of DNA by the addition of alkali (NaOH) has been observed by means of viscosity measurements, although the macroscopic value of pH did not vary from 7.0. It is assumed that the local pH where the alkali enters the DNA solution must be sufficiently high to denature the DNA, despite the fact that the solution is rapidly stirred. Similar results have been obtained on additions of hydrochloric acid. P.G.

A69-43272 *
STEADY-STATE ANALYSIS OF THE HUMAN RESPIRATORY SYSTEM.
H. T. Milhorn, Jr. and D. R. Brown (Mississippi, University, Medical Center, Dept. of Physiology and Biophysics, Jackson, Miss.).
IN: AMERICAN AUTOMATIC CONTROL COUNCIL, JOINT AUTOMATIC CONTROL CONFERENCE, 10TH, UNIVERSITY OF COLORADO, BOULDER, COLO., AUGUST 5-7, 1969, PREPRINTS OF TECHNICAL PAPERS. (A69-43267 24-10)
New York, American Institute of Chemical Engineers, 1969, p. 141, 142. 10 refs.
PHS Grant No. HE-11678; Grant No. NGR-25-002-115.

Study of the human respiratory system on the basis of a steady-state model of the system and a variation of the parameters of the model. The system is divided into two parts. The controlled system consists of the theoretical relationships between alveolar ventilation and alveolar partial pressures of carbon dioxide and oxygen. The controlling system consists of the experimental relationship between alveolar partial pressures of carbon dioxide and oxygen and alveolar ventilation. A block diagram of the steady-state respiratory system is presented. G.R.

A69-43273 *
AN INFORMATION PROCESSING MODEL FOR TACTILE PERCEPTION.
James C. Bliss (Stanford Research Institute, Menlo Park, Calif.).
IN: AMERICAN AUTOMATIC CONTROL COUNCIL, JOINT AUTOMATIC CONTROL CONFERENCE, 10TH, UNIVERSITY OF COLORADO, BOULDER, COLO., AUGUST 5-7, 1969, PREPRINTS OF TECHNICAL PAPERS. (A69-43267 24-10)
New York, American Institute of Chemical Engineers, 1969, p. 144, 145. 7 refs.
Research supported by the Social Rehabilitations Service; Contracts No. NAS 2-3649; No. NAS 2-4582; No. AF 33(615)-68-1435.

Organization of recent tactile research results into a model which describes information processing by the tactile channel. According to this model, when a pattern is briefly presented tactually, a filtered (but relatively unprocessed) image of the pattern is stored in a "sensory register" for about 1 sec. As this image is "fading," a limited portion of the information is processed and transferred to a "short term store." The subject has remarkable control over which information is processed and how it is processed. Possible applications of this model are in the design of tactile displays and in obtaining a better understanding of nervous system mechanisms. (Author)

A69-43274 *
VESTIBULAR MODELS.
Laurence R. Young (Massachusetts Institute of Technology, Dept. of Aeronautics and Astronautics, Cambridge, Mass.).
IN: AMERICAN AUTOMATIC CONTROL COUNCIL, JOINT AUTOMATIC CONTROL CONFERENCE, 10TH, UNIVERSITY OF COLORADO, BOULDER, COLO., AUGUST 5-7, 1969, PREPRINTS OF TECHNICAL PAPERS. (A69-43267 24-10)
New York, American Institute of Chemical Engineers, 1969, p. 146, 147. 8 refs.
Grants No. NsG-577; No. NGL-22-009-156.

Development of a quantitative mathematical model for the vestibular system, relating the time history of linear and angular motions to nonvisual perception of orientation, motion, and nystagmus. The models developed are "input-output" models; however, in each case an attempt is made to relate the parameters of the model to known physiological characteristics. A physical analog of the vestibular system was built, using gyros, accelerometers, gimbals, and a special-purpose analog computer. G.R.

A69-43320 *
HUMAN OPERATOR CHARACTERISTICS BASED ON AN ANALOG COMPUTER ORIENTED PARAMETER IDENTIFICATION TECHNIQUE.
August L. Burgett (South Florida, University, Tampa, Fla.).
IN: AMERICAN AUTOMATIC CONTROL COUNCIL, JOINT AUTOMATIC CONTROL CONFERENCE, 10TH, UNIVERSITY OF COLORADO, BOULDER, COLO., AUGUST 5-7, 1969, PREPRINTS OF TECHNICAL PAPERS. (A69-43267 24-10)
New York, American Institute of Chemical Engineers, 1969, p. 988, 989. 6 refs.
Contract No. NASr-54(06).

Development of a parameter identification algorithm applicable to the identification of linear dynamic systems by means of a digital computer. The method described is used to identify characteristics of the human operator in a closed-loop control situation. Z.W.

A69-43323
BRIGHTNESS DISCRIMINATION IN REFLECTED LASER LIGHT.
L. E. Hogan, C. L. Rudder, S. H. Levine, and C. L. Askland, Jr. (McDonnell Douglas Corp., Saint Louis Reconnaissance Laboratory, St. Louis, Mo.).
Psychonomic Science, vol. 14, Mar. 25, 1969, p. 265, 266.

Description of brightness discrimination judgments made for gray chips by 12 male human subjects using the psychophysical method of limits. White, noncoherent red, and He-Ne laser light sources of equal power were used. The data showed poorer discrimination from white to red to laser light and better discrimination when trials started from the darker end of the stimulus range. The results obtained are discussed in terms of human spectral sensitivity, masking effects of the standing diffraction pattern in laser light, and brightness contrast between the stimulus and surrounding. P.G.

A69-43325 *
MODEL OF THE ADAPTIVE BEHAVIOR OF THE HUMAN OPERATOR IN RESPONSE TO A SUDDEN CHANGE IN THE CONTROL SITUATION.
Anil V. Phatak and George A. Bekey (Southern California, University, Dept. of Electrical Engineering, Los Angeles, Calif.).
IEEE Transactions on Man-Machine Systems, vol. MMS-10, Sept. 1969, p. 72-80. 18 refs.
Grant No. NGR-05-018-022.

Development of an adaptive model to describe the behavior of the human operator in response to sudden changes in plant dynamics and transient disturbances. The plant simulated for tracking experiments is approximately second-order and has rate and attitude feedback augmentation for increased stability. The failure of the rate sensor and/or the attitude sensor results in a sudden transition in the order and gain of the effective plant dynamics. These failures may be accompanied by hard-over transient conditions in either the rate or attitude sensors. The adaptive model suggested has a variable

structure, contains model switching based on pattern recognition as evidence, and incorporates the decision-control logic required for successful adaptation to failures. The model in effect attempts to mimic the control strategy or algorithm used by a trained operator. (Author)

A69-43326
AN APPLICATION OF MEASUREMENT METHODS TO IMPROVE THE QUANTITATIVE NATURE OF PILOT RATING SCALES.
John D. McDonnell (McDonnell Douglas Corp., Douglas Aircraft Co., Flight Guidance Group, Long Beach, Calif.).
IEEE Transactions on Man-Machine Systems, vol. MMS-10, Sept. 1969, p. 81-92. 20 refs.
Contract No. AF 33(615)-3960.

Discussion of various forms of pilot rating scales, and description of an attempt to overcome the problem of their unknown quantitative character. Currently used scales include wording ambiguity, a dual mission character, and a lack of information about the quantitative character of the scale continuum. A semantic experiment is conducted that makes it possible to scale the wording used in rating scales. The results of the application of the method of successive intervals indicate that contemporary scale data can be averaged directly with little error if a reliable estimate of the mean is available. However, the number of samples necessary to obtain a reliable estimate depends on the rating itself, and increases as the rating becomes worse, so that the design of an experiment would need to depend on the outcome of the same experiment. The problem could be avoided by constructing a scale based on the successive interval scale values, where variability along the scale is constant. Z.W.

A69-43336 *
COMPLEMENT-FIXING ANTIGEN FROM BHK-21 CELL CULTURES INFECTED WITH LYMPHOCYTIC CHORIOMENINGITIS VIRUS.
William J. Brown and B. E. Kirk (West Virginia University, Medical Center, Dept. of Microbiology, Morgantown, W. Va.).
Applied Microbiology, vol. 18, Sept. 1969, p. 496-499. 12 refs.
PHS-supported research; Grant No. NsG-533.

Description of experiments in which significant titers of complement-fixing (CF) antigen were obtained by infecting BHK-21 cells with lymphocytic choriomeningitis virus. The effect of the inoculum dose on the antigen production rates, the heat lability of the antigen, and attempts to separate it from the virus are discussed. The antigen is compared with an antigen obtained from the spleen of guinea pigs. V.Z.

A69-43369
INTERNATIONAL CONGRESS OF AEROSPACE MEDICINE, 18TH, AMSTERDAM, NETHERLANDS, SEPTEMBER 15-18, 1969, *FREE COMMUNICATIONS.*
The Hague, Inter Scientias, 1969. 578 p. In English and French.

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BRAZILIAN AIR FORCE MEDICAL SERVICES. W. de Oliveira Freitas (Brazilian Air Force, Rio de Janeiro, Brazil), p. 317-330.

UNSCHEDULED LANDINGS FOR MEDICAL REASONS—A FIVE-YEAR SURVEY OF THE EXPERIENCE AT AMERICAN AIRLINES. V. Schocken and L. G. Lederer, p. 333-339. (See A69-43393 24-05)

EVALUATION OF THE THERAPEUTIC VALUE OF DIMETHYL SULFOXIDE (DMSO) IN ACUTE STRAINS AND SPRAINS, BURSITIS, AND TENDONITIS, BY DOUBLE BLIND CLINICAL INVESTIGATION. J. H. Brown, p. 343, 344.

INVESTIGATION ON THE DISPLACEMENT OF PLASMA PROTEINS OF RATS BLOOD WHEN EXPOSED TO THE INFLUENCE OF ACCELERATIONS AND HYPOKINESIA. B. Stanislaw and W. Mieczyslaw (Wojskowy Instytut Medycyny Lotniczej, Warsaw, Poland), p. 347-349.

OCULAR HOMOEOSTASIS IN HYPERBARIC CIRCUMSTANCES AT HIGH ALTITUDES (L'HOMEOSTASIE OCULAIRE EN L'HYPOBARISME DES GRANDES ALTITUDES). M. P. Popescu (Medico-Pharmaceutical Institute, Bucharest, Rumania), p. 353, 354.

A MINIATURIZED PUMP OXYGENERATOR FOR EVALUATION OF PERIPHERAL CIRCULATORY CHANGES INDUCED BY LONGTERM WEIGHTLESSNESS IN RATS. V. Popovic and P. Popovic (Emory University, Atlanta, Ga.), p. 357-360. (See A69-43394 24-05)

ELECTRONEURAL METHOD FOR SEDATION AND SLEEP IN AVIATION MEDICINE. S. A. Ziemnowicz-Radvan (Brain Research Foundation, Washington, D.C.), p. 363, 364.

CHINA'S LEGACY TO THE EXPLORATION OF SPACE. C. D. J. Generales, Jr., p. 367-397.

PSYCHIATRICAL AND PSYCHOLOGICAL APPROACH. H. Gartmann, p. 401-407. 6 refs. (See A69-43395 24-05)

MEDICAL PROBLEMS IN SPACE. D. E. Busby (Continental Air Lines, Inc., Los Angeles, Calif.), p. 411-418. (See A69-43396 24-05)

THE SPINAL COLUMN OF PILOTS AND THE SEAT. de Sambucy and G. Clerc, p. 421, 422.

EXOBIOLOGY. A. W. Schwarz (Nijmegen, Catholic University, Nijmegen, Netherlands), p. 425, 426.

BACTERIAL ACTIVITY IN LOW AMBIENTAL PRESSURE. F. M. Merayo, p. 429-437. 20 refs. (See A69-43397 24-04)

FACTORS INFLUENCING THE TIME OF SAFE UNCONSCIOUSNESS (TSU) FOR COMMERCIAL JET PASSENGERS FOLLOWING CABIN DECOMPRESSION. J. G. Gaume (McDonnell Douglas Corp., Long Beach, Calif.), p. 447-457. 5 refs. (See A69-43398 24-05)

EVALUATION OF THE SKIAGRAM. F. Rempt, J. Hoogerheide, and W. P. H. Hoogenboom (National Aeromedical Centre, Soesterberg, Netherlands), p. 461-464. (See A69-43399 24-04)

ACQUIRED MYOPIA IN YOUNG PILOTS. J. Hoogerheide, F. Rempt, and W. P. H. Hoogenboom (National Aeromedical Centre, Soesterberg, Netherlands), p. 467-470. (See A69-43400 24-04)

LAMBDA WAVES IN EEG OF NORMAL ADULTS AND THEIR RELATION TO COMPLEXITY OF VISUAL IMAGERY. D. N. J. Donker (National Aeromedical Centre, Soesterberg, Netherlands) and J. F. Smits (Utrecht, State University, Utrecht, Netherlands), p. 473-478. (See A69-43401 24-04)

THE PROBLEM OF AMOEBIASIS AMONG FOREIGN CREW IN SOUTHEAST ASIA, p. 481-484.

U.S. AIRCRAFT HIJACKINGS—EPIDEMIOLOGICAL CONSIDERATIONS, p. 487, 488.

BASIC STUDIES ON HIRUDO MEDICINALIS FOR A SPACE EXPERIMENT. I. R. G. A. Lotz, M. E. A. Fuchs, and P. E. A. Moyat (Frankfurt, Universität, Frankfurt am Main, West Germany), p. 491-498. 9 refs. (See A69-43402 24-04)

BASIC STUDIES ON HIRUDO MEDICINALIS FOR A SPACE EXPERIMENT. II. R. G. A. Lotz and G. H. Bowman (Frankfurt, Universität, Frankfurt am Main, West Germany), p. 501-507. (See A69-43403 24-04)

THE URINARY EXCRETION OF HORMONAL METABOLITES BEFORE, DURING AND AFTER INTERCONTINENTAL FLIGHTS. Th. Strengers (O. L. Vr. Gasthuis, Amsterdam, Netherlands), p. 511-514. 5 refs. (See A69-43404 24-04)

REDUCTION OF THE OXYGEN CONSUMPTION DURING ANOXIA (ABAISSEMENT DE LA CONSOMMATION D'OXYGENE AU COURS DE L'ANOXIE). M. V. Strumza and D. Zaoui (Paris, Université, Paris, France), p. 517.

SELECTIVE G-FORCE APPLICATION IN THE TREATMENT OF RETINAL DETACHMENT. J. ten Doesschate, R. Hoppenbrouwers, and M. P. Lansberg (National Aeromedical Centre, Soesterberg, Netherlands), p. 521-525. (See A69-43405 24-04)

THE RELATIONSHIP BETWEEN SOME PHYSIOLOGICAL AND PSYCHOLOGICAL VARIABLES. L. Pannekoek and L. K. F. Njio, p. 529-531. (See A69-43406 24-04)

CIRCADIAN RHYTHM AND PERFORMANCE. M. v. Zoeren, J. H. H. Thijssen, and L. Pannekoek (National Aeromedical Centre, Soesterberg, Netherlands), p. 535-539. (See A69-43407 24-04)

A PECULIAR CLINICAL CASE BOTH OF HYPOXIA AND HYPOTHERMIA STUDIED IN A 18 YEARS OLD STOWAWAY FROM HABANA TO MADRID. J. M. Pajares (Gran Hospital;

Madrid, University, Madrid, Spain), p. 543, 544.

PECULIARITIES OF THE RESPONSE OF THE ACOUSTIC ANALYZER OF MAN DURING PROLONGED NOISE EFFECT IN A YEAR-LONG MEDICO-ENGINEERING EXPERIMENT. T. N. Krupina, E. I. Mantsev, V. Ya. Levanov, M. A. Vytchikova, and I. Ya. Yakovleva, p. 547-549. (See A69-43408 24-05)

GROUP PSYCHOPHYSIOLOGICAL METHODS OF SELECTION AND RECRUITMENT OF FLYING CREWS. M. A. Novikov and A. A. Gerasimovich, p. 553, 554.

PHARMACOLOGICAL CORRECTION OF CHANGES IN WATER-SALT AND PROTEIN METABOLISM DURING A 120-DAY BED REST EXPERIMENT. T. N. Krupina, G. P. Mikhailovsky, M. M. Korotaev, E. I. Sokolov, A. Ya. Tizul, Z. P. Pak, V. P. Bychkov, and I. Ya. Yakovleva, p. 557, 558.

METHODS OF RECORDING PHYSIOLOGICAL PARAMETERS DURING SOYUZ SPACE FLIGHTS. L. I. Kakurin, I. S. Shadrintsev, and A. G. Zerenin, p. 561.

DYNAMIC RESPONSE OF THE HUMAN CENTRAL NERVOUS SYSTEM TO THE EFFECTS OF CLOSED VOLUME AND HYPOKINESIA. E. V. Kukolevskaya, p. 565, 566.

DIAGNOSTICS OF EARLY FORMS OF ATHEROSCLEROSIS AND LATENT CORONARY INSUFFICIENCY IN FLIGHT CREWS. B. L. Gelman, I. M. Pishugin, G. L. Strongin, L. I. Kuznetsova, and A. A. Shishova, p. 569.

MEDICAL QUESTIONS IN THE ACTIVITY OF TECHNICAL PERSONNEL OF CIVIL AVIATION. V. V. Levashov, p. 573, 574.

PREFLIGHT MEDICAL INSPECTION OF FLIGHT CREWS. A. I. Kraftsov and G. N. Druzhinina, p. 577, 578.

A69-43370 #

THE EFFECT OF SUPERSONIC FLYING ON THE URINARY CATECHOLAMINE EXCRETION IN PILOTS.

R. Debijadji, L. Perović, and V. Varagić (Institute of Aviation Medicine, Zemun, Yugoslavia).

IN: INTERNATIONAL CONGRESS OF AEROSPACE MEDICINE, 18TH, AMSTERDAM, NETHERLANDS, SEPTEMBER 15-18, 1969, FREE COMMUNICATIONS. (A69-43369 24-04)

The Hague, Inter Scientias, 1969, p. 5-12. 17 refs.

Study of the rates of urinary catecholamine excretion in three groups of 16, 15, and 7 jet pilots after 750 to 850, 2100, and 1850 km/hr flights at altitudes of 6000, 13,000 and 18,500 m, respectively, with samples of urine taken 45 min before and after the flight. Significantly increased catecholamine excretion during these supersonic flights and adaptation during repeated flights are established. It is believed that the emotional state of the pilots, whose reactions adhered to an "all or nothing" law, is responsible for the increased catecholamine excretion during the supersonic flights. V.Z.

A69-43371 #

THE EFFECT OF POSITIVE PRESSURE BREATHING ON THE CEREBRAL CIRCULATION AND THE CONTENT OF CATECHOLAMINES IN HYPOTHALAMUS AND ADRENALS.

Radović I. Aleksandar, Davidović M. Jovan, and Davidović Vukosava (Institute of Aviation Medicine, Zemun, Yugoslavia).

IN: INTERNATIONAL CONGRESS OF AEROSPACE MEDICINE, 18TH, AMSTERDAM, NETHERLANDS, SEPTEMBER 15-18, 1969, FREE COMMUNICATIONS. (A69-43369 24-04)

The Hague, Inter Scientias, 1969, p. 15-27. 21 refs.

Investigation of the cerebral arterial and venous blood pressure, the catecholamine content in the hypothalamus and adrenal glands, and the histological changes in the cerebrum in a group of 21 anesthetized dogs under conditions of positive pressure breathing created by applying gradually increasing pressures of 2, 8, 11, 15, 19, and 28 cm of water to the respiratory tract. The venous blood pressure in the longitudinal sinus of the experimental dogs gradually increased over the entire range of the applied pressures to a multiple of the original level. The blood pressure in the circulus arteriosus cerebri remained without appreciable changes under pressures of up to 15 cm water and decreased at 28 cm. The catecholamine content increased in the hypothalamus and decreased in the adrenal glands at pressures of 15 and 28 cm. The serious damage observed in the cerebrum of the experimental dogs is noted. V.Z.

A69-43372 * #

THE CENTRIFUGE AS A THERAPEUTIC DEVICE.

R. Pelligra, S. Stein, J. Dickson, K. Skrettingland (NASA, Ames Research Center, Moffett Field, Calif.), J. Markham, P. Lippe (NASA, Ames Research Center, Moffett Field; Stanford University, Stanford, Calif.), and J. Noyes (NASA, Ames Research Center, Moffett Field; O'Connor Hospital, San Jose, Calif.).

IN: INTERNATIONAL CONGRESS OF AEROSPACE MEDICINE, 18TH, AMSTERDAM, NETHERLANDS, SEPTEMBER 15-18, 1969, FREE COMMUNICATIONS. (A69-43369 24-04)

The Hague, Inter Scientias, 1969, p. 31-39, 41, 43 (7 ff.).

Description of a therapeutic application of centrifugation by which a 10 by 6 by 4 mm bullet fragment floating freely in the ventricular system of the human brain was moved to a fixed safe position where it was embedded in the posterolateral wall of the left lateral ventricle. The patient was briefly exposed to increased accelerations in a centrifuge with five degrees of freedom at the NASA Ames Research Center. He has remained symptom-free without an apparent neurological deficit over a period of six months following this procedure. V.Z.

A69-43373 #

OCULOBULBAR VERGENCE CHANGES INDUCED BY M-1 VALSALVA MANEUVERS.

Leonard Michael Fenning.

IN: INTERNATIONAL CONGRESS OF AEROSPACE MEDICINE, 18TH, AMSTERDAM, NETHERLANDS, SEPTEMBER 15-18, 1969, FREE COMMUNICATIONS. (A69-43369 24-04)

The Hague, Inter Scientias, 1969, p. 61-77. 13 refs.

Investigation of the effect of cardiovascular stresses induced by M-1 Valsalva maneuvers on the oculobulbar vergence of a group of subjects observing a Thorington scale at a distance of 40 cm in a specially designed experimental assembly. Sympathicotonic, normotonic, and vagotonic profiles of the phoria drift similar to the blood pressure variations and varying from individual to individual are established in the subjects immediately following the abdominal relaxation. Transitory changes in the visual fields, accommodation, and pupillary reaction are also noted. Dexamyl, Donnatal, and caffeine, as well as sequential stresses, changed the expected phoria drift and the time of persistence of the effects. The probable physiological mechanisms of the effects observed are discussed. V.Z.

A69-43374 #

METHODS FOR THE STUDY OF THE BEHAVIOUR OF HUMAN CIRCADIAN RHYTHMS IN KIDNEY FUNCTION BEFORE, DURING AND AFTER GLOBAL FLIGHTS.

F. Gerritzen.

IN: INTERNATIONAL CONGRESS OF AEROSPACE MEDICINE, 18TH, AMSTERDAM, NETHERLANDS, SEPTEMBER 15-18, 1969, FREE COMMUNICATIONS. (A69-43369 24-04)

The Hague, Inter Scientias, 1969, p. 81, 82.

Specification of the urine sampling conditions which facilitate the obtaining of reliable results in studying the circadian rhythm of the kidney function during global flights. The conditions concern food and water intake by the subjects, sampling intervals, and the body position. The possible causes of the inconsistencies in the circadian rhythm results obtained during several intercontinental flights are discussed. V.Z.

A69-43375 #
OBSERVATION OF SOME CIRCULATORY REACTIONS AFTER CUMULATION OF VEGETATIVE STIMULI.
Botka, Moucka, Horáček, and Novák.
IN: INTERNATIONAL CONGRESS OF AEROSPACE MEDICINE, 18TH, AMSTERDAM, NETHERLANDS, SEPTEMBER 15-18, 1969, FREE COMMUNICATIONS. (A69-43369 24-04)
The Hague, Inter Scientias, 1969, p. 87-91.

Brief evaluation of the results of a study of the circulatory reactions in a group of 275 pilot cadets and in a control group of 127 applicants by the "cumulative stress" method which remotely simulates the vegetative stimuli of flight. Statistically summarized data are given for the pulse frequencies and respiratory arrhythmias recorded. The occurrence of cases of sinoauricular block and cardiac arrest is mentioned. V.Z.

A69-43376 #
F-5 COCKPIT FOGGING IN SOUTH VIETNAM.
Do Xuan Giu (South Vietnamese Air Force, Saigon, South Vietnam).
IN: INTERNATIONAL CONGRESS OF AEROSPACE MEDICINE, 18TH, AMSTERDAM, NETHERLANDS, SEPTEMBER 15-18, 1969, FREE COMMUNICATIONS. (A69-43369 24-04)
The Hague, Inter Scientias, 1969, p. 99-102.

Discussion of the occurrence of hazardous cockpit fogging during low flights and dive bombing as frequently experienced by the air force of the Republic of Vietnam, especially by its F-5 and other small-cockpit fighters. The hot and humid weather conditions are indicated as the cause of the cockpit fogging. Recommendations concerning the cockpit temperature and pilot diet are given as remedies. V.Z.

A69-43377 #
COMMENTS ON ICAO RECOMMENDATIONS CONCERNING HEARING REQUIREMENTS FOR FLIGHT PERSONNEL (A PROPOS DES RECOMMANDATIONS DE L'O.A.C.I. SUR LES NORMES AUDITIVES DU PERSONNEL NAVIGANT TECHNIQUE).
J. Pasquet and J. Lavernhe (Compagnie Nationale Air France, Service Médical, Paris, France).
IN: INTERNATIONAL CONGRESS OF AEROSPACE MEDICINE, 18TH, AMSTERDAM, NETHERLANDS, SEPTEMBER 15-18, 1969, FREE COMMUNICATIONS. (A69-43369 24-04)
The Hague, Inter Scientias, 1969, p. 117-122. In French.

Discussion of the evaluation of hearing tests of flight personnel with regard to ICAO recommendations. Widespread use of the tonal audiogram during flight fitness check has shown that the hearing of many flight staff members (about 8 per cent of all cockpit crews) is below the standards required by the ICAO recommendations. It is noted that all these crew members proved that they possessed sufficient hearing to carry out their duties in total safety. It is therefore proposed that, when a flight crew member on active duty is found to have a tonal hearing threshold that is not in keeping with recommended standards, he must undergo a vocal audiometric test, in which intelligibility shall amount to 50 per cent of the language elements at 40 dB above the reference level. P.G.

A69-43378 #
PSYCHOTHERAPY AND CHEMOTHERAPY IN AVIATION MEDICINE (PSYCHOTHERAPIES ET CHIMIOTHERAPIES EN MEDECINE AERONAUTIQUE).
C. J. Blanc and R. J. Digo (Compagnie Nationale Air France, Service Médical, Paris, France).
IN: INTERNATIONAL CONGRESS OF AEROSPACE MEDICINE, 18TH, AMSTERDAM, NETHERLANDS, SEPTEMBER 15-18, 1969, FREE COMMUNICATIONS. (A69-43369 24-04)
The Hague, Inter Scientias, 1969, p. 125-131. In French.

Survey of neuropsychiatric problems based on data obtained from 2300 psychiatric consultations carried out among the personnel of a large French airline. It is noted that among ground personnel neuropsychiatry ranks first among the causes of absenteeism (37 per cent of cases). Among flight personnel, the rates of psychiatric morbidity are very high among stewardesses (20 per cent), quite high with stewards (10 per cent), and low but not insignificant with pilots and flight engineers (1 to 2 per cent). It was found that depressive and neurotic conditions form the most widely represented syndromes among the patients (40 to 80 per cent of the subjects examined). It is concluded that psychopharmacology with antidepressants, tranquillizers, and neuroleptics gives good results among ground staff. Antidepressants and thymoanaleptics must be used only on exceptional occasions with cockpit crews as they always induce long periods of unfitness for flight. In such cases psychotherapy is recommended. Conventional Freudian psychoanalysis is also counterindicated in the case of cockpit crews on active duty. P.G.

A69-43379 #
THE ROLE OF RADIOLOGY IN MEDICAL INVESTIGATIONS AFTER EJECTION OF MILITARY JET PILOTS (LA PART DE LA RADIOLOGIE DANS L'ENQUETE MEDICALE APRES EJECTION DES PILOTES MILITAIRES D'AVIONS A REACTION).
Roland-Paul Delahaye, Georges Gueffier, Henri Seris, and Robert Auffret.
IN: INTERNATIONAL CONGRESS OF AEROSPACE MEDICINE, 18TH, AMSTERDAM, NETHERLANDS, SEPTEMBER 15-18, 1969, FREE COMMUNICATIONS. (A69-43369 24-04)
The Hague, Inter Scientias, 1969, p. 135-150. In French.

Discussion of radiological findings in the course of medical investigations of a large number of cases of jet pilot ejection. It is shown that radiology permits an exact diagnosis of injuries and gives important information about the history and the pathological mechanism of the observed injuries. Fractures produced during ejection and during touchdown are described. Spine injuries are studied, and the importance of the spine position of the pilot in the ejection seat is stressed. A case of ejection at supersonic speed with a fatal outcome is discussed, and characteristic injuries are pointed out. P.G.

A69-43380 #
HUMAN RESISTANCE TO ACCELERATIONS OF HIGH INTENSITY AND SHORT DURATION--MECHANICAL AND CIRCULATORY EFFECTS (RESISTANCE DU CORPS HUMAIN AUX ACCELERATIONS ELEVEES DE COURTE DUREE--EFFETS MECANIQUES ET HEMODYNAMIQUES).
R. Auffret, H. Seris, J. Demange, and R. P. Delahaye.
IN: INTERNATIONAL CONGRESS OF AEROSPACE MEDICINE, 18TH, AMSTERDAM, NETHERLANDS, SEPTEMBER 15-18, 1969, FREE COMMUNICATIONS. (A69-43369 24-04)
The Hague, Inter Scientias, 1969, p. 153-162. 12 refs. In French.

Investigation of the effects of high-intensity (6.5 to 13.5 g) and short-duration (0.8 sec) acceleration on human beings with the aid of centrifuge experiments. It is shown that the resistance of the spinal column is a function of the acceleration amplitude in the direction of the spinal column. The circulatory aspects of acceleration were studied, and it is found that accelerations of longer duration (more than a second) create hemodynamical phenomena. The existence of clinical and radiological disorders has been proved, which are assumed to be caused by the repeated testing and by the existence of parasitic accelerations in the direction of the x- and y-axes, in addition to the acceleration exerted in the direction of the z-axis. A rheographical investigation showed two circulatory and cerebral effects--namely, a rapid venous drainage during acceleration and the persistence of blood circulation at the beginning of the acceleration stage in harmony with the psychophysiological condition of the subject. P.G.

A69-43381 #
THE EFFECTS OF MILD ACUTE PHYSICAL STRESS ON DELIVERY AND NEONATAL MORTALITY IN RATS.

M. F. Foley, C. R. Huie, and C. E. Billings.
IN: INTERNATIONAL CONGRESS OF AEROSPACE MEDICINE, 18TH, AMSTERDAM, NETHERLANDS, SEPTEMBER 15-18, 1969, FREE COMMUNICATIONS. (A69-43369 24-04)
The Hague, Inter Scientias, 1969, p. 165-168.

Results of studies carried out on pregnant rats exposed to the moderate stress of an automobile ride, and the more severe stress of an automobile ride combined with an aircraft flight featuring varying gravitational loads. Rats stressed with the automobile ride alone did not differ significantly from those subjected to the aircraft flight. All stressed rats showed a greater range in the length of gestation and produced a much greater number of dead young. T.M.

A69-43382 #
HEAT TOLERANCE IN THE CASE OF VENTILATION FAILURE IN A SUPERSONIC TRANSPORT AIRCRAFT (TOLERANCE A LA CHALEUR DANS LE CAS DE PANNE DE LA CLIMATISATION SUR AVION DE TRANSPORT SUPERSONIQUE).
J. Colin, C. Boutelier, and J. Timbal (Centre d'Essais en Vol, Laboratoire de Médecine Aérospatiale, Brétigny-sur-Orge, Essonne, France).
IN: INTERNATIONAL CONGRESS OF AEROSPACE MEDICINE, 18TH, AMSTERDAM, NETHERLANDS, SEPTEMBER 15-18, 1969, FREE COMMUNICATIONS. (A69-43369 24-04)
The Hague, Inter Scientias, 1969, p. 171-179. 7 refs. In French.

Investigation of the consequences of a failure in the air-conditioning system of an SST aircraft in terms of the physiological reactions and psychomotor behavior of the crew members and passengers. As long as the temperature remains below 42 deg C, the cabin atmosphere permits evaporation to maintain thermal equilibrium at high altitudes. Above this temperature, the accumulation of heat becomes an important parameter. Curves are given for the tolerance times required to attain certain levels of heat storage at two different rates of metabolic heat production. T.M.

A69-43383 #
IN-FLIGHT MEDICAL DISORDERS IN THE FRENCH AIR FORCE—ANALYTICAL STUDY FROM 1961 TO 1968 (LES MALAISES EN VOL DANS L'ARMEE DE L'AIR FRANCAISE—ETUDE ANALYTIQUE DE 1961 A 1968).
P. Pesquies, P. M. Pingannaud, J. Nathie, and J. Borsarello.
IN: INTERNATIONAL CONGRESS OF AEROSPACE MEDICINE, 18TH, AMSTERDAM, NETHERLANDS, SEPTEMBER 15-18, 1969, FREE COMMUNICATIONS. (A69-43369 24-04)
The Hague, Inter Scientias, 1969, p. 183-191. In French.

Results of an analytical study of 111 reported in-flight medical disorders which were sustained by crew members (mostly pilots) of different types of aircraft in the French Air Force during the period from 1961 to 1968. The incidence of the disorders is correlated with the number of aircraft accidents over this period, the type of aircraft, age of the crew members, and etiology. The highest incidence of disorders is exhibited below the age of thirty and correlates with the least amount of flight experience. Psychological factors are shown to be present in most of the cases studied. T.M.

A69-43384 #
INFLUENCE OF ALTITUDE ON HUMAN HEAT EXCHANGE (INFLUENCE DE L'ALTITUDE SUR LES ECHANGES THERMIQUES DE L'HOMME).
J. Timbal, J. Colin, and Ch. Boutelier (Centre d'Essais en Vol, Laboratoire de Médecine Aérospatiale, Brétigny-sur-Orge, Essonne, France).
IN: INTERNATIONAL CONGRESS OF AEROSPACE MEDICINE, 18TH, AMSTERDAM, NETHERLANDS, SEPTEMBER 15-18, 1969, FREE COMMUNICATIONS. (A69-43369 24-04)
The Hague, Inter Scientias, 1969, p. 203-210. 7 refs. In French.

Results of experimental studies of the effect of barometric pressure on heat transfer by convection from the human body in air. Body-temperature measurements were made on subjects exposed to environments with independently controlled air speed and temperature, radiant temperature, and humidity. The results were used to derive empirical formulas for heat exchange as a function of air density, speed, and temperature. It is shown that high altitude facilitates evaporation of perspiration but hinders heat exchange by convection. T.M.

A69-43385 #
EFFECTS OF PROLONGED POSITIVE ACCELERATIONS (+3 G_z) ON THE VARIATIONS OF HUMAN CARDIAC OUTPUT (EFFETS DES ACCELERATIONS POSITIVES PROLONGEES (+3 Gz) SUR LES VARIATIONS DU DEBIT CARDIAQUE HUMAIN).
J. M. R. Demange (Centre d'Essais en Vol, Laboratoire de Médecine Aérospatiale, Brétigny-sur-Orge, Essonne, France).
IN: INTERNATIONAL CONGRESS OF AEROSPACE MEDICINE, 18TH, AMSTERDAM, NETHERLANDS, SEPTEMBER 15-18, 1969, FREE COMMUNICATIONS. (A69-43369 24-04)
The Hague, Inter Scientias, 1969, p. 219-227. In French.

Study of the circulatory reactions of human subjects subjected to +3 G_z in a centrifuge for periods ranging from 20 to 120 min, with or without an anti-g suit. At the start of the centrifuge an increase in the cardiac frequency occurred, as well as an increase in the arterial pressure, the systolic volume, and the cardiac output. After about two or three minutes, the subjects stabilized. Measurements of the cardiac output by electric plethysmography made it possible to continuously follow the circulatory variations under the influence of acceleration. Such studies are of interest in the training and selection of aircrew personnel. F.R.L.

A69-43386 #
A STUDY OF SIMULATED AIRLINE PILOT INCAPACITATION.
C. R. Harper, G. J. Kidera, and J. F. Cullen (United Air Lines, Inc., Medical Dept., Chicago, Ill.).
IN: INTERNATIONAL CONGRESS OF AEROSPACE MEDICINE, 18TH, AMSTERDAM, NETHERLANDS, SEPTEMBER 15-18, 1969, FREE COMMUNICATIONS. (A69-43369 24-04)
The Hague, Inter Scientias, 1969, p. 231-243.

Results of a study of the effects of simulated pilot incapacitation (involving an abrupt functional loss such as myocardial infarction or a cerebrovascular accident) on the behavior of qualified airline crews performing flight tasks. Twenty-five tests were conducted in a DC-8 simulator, while 20 tests were performed in a B-737 simulator. Three-man crews were studied in the DC-8, and two-man crews in the B-737. Results are given for different simulated altitudes and phases of flight at which "incapacitations" occurred. Major observations and recommendations are given from the standpoints of operational aspects and medical human factor aspects. T.M.

A69-43387 #
CIRCADIAN PERIODICITY OF REACTION-TIMES.
Jürgen C. Aschoff (Ulm, University, Dept. of Neurology, Ulm, West Germany).
IN: INTERNATIONAL CONGRESS OF AEROSPACE MEDICINE, 18TH, AMSTERDAM, NETHERLANDS, SEPTEMBER 15-18, 1969, FREE COMMUNICATIONS. (A69-43369 24-04)
The Hague, Inter Scientias, 1969, p. 247-254.

Investigation of the influence of repetition and diurnal periodicities on reaction times. Using the Bettendorf apparatus, a total of 47,000 reaction times have been measured on 24 persons in two- to four-hour intervals during normal day/night cycles and during 24-hour wakefulness. A decrease in the reaction times due to learning was observed in the first 24-hour period and thereafter to a far lesser extent even up to the fourth day. It was found that learning was significantly more increased in response to acoustic than to

visual stimuli. A significant circadian periodicity (p less than 0.01) was observed in experiments with normal day/night cycles; with complex visual stimuli the minimum average reaction time was 480 msec in the early afternoon, while the maximum (560 msec) occurred after midnight. Under conditions of 24-hour wakefulness, reaction times failed to show any significant diurnal periodicity. It is concluded that, as far as reaction times are concerned, no immediate danger for task performance seems to arise from continuous 24-hour wakefulness. P.G.

A69-43388 #
FREQUENCY OF URINARY LITHIASIS AMONG AIRCREWS (LITHIASE URINAIRE ET PERSONNEL NAVIGANT).
R. Pannier, G. Leguay, and A. Didier (Ministère des Armées, Hôpital des Armées D. Larrey, Versailles, France).
IN: INTERNATIONAL CONGRESS OF AEROSPACE MEDICINE, 18TH, AMSTERDAM, NETHERLANDS, SEPTEMBER 15-18, 1969, FREE COMMUNICATIONS. (A69-43369 24-04)
The Hague, Inter Scientias, 1969, p. 257-270. In French.

Review of the etiology, symptomatology, therapeutics, and prevention of urinary lithiasis with respect to aircrews which are frequently afflicted by this disease. Twenty-two cases of urinary lithiasis were studied on flying personnel. It was observed that painful crises during flight are rare. Six of the sick subjects had to have recourse to surgery. It is noted that not a single incapacity was pronounced as a result of lithiasis during a career. Prevention consists of (1) the elimination of any subject presenting a uropathy because this may stimulate lithiasis, (2) improvement of the air conditioning in aircraft cabins and of the thermal comfort of clothes, and (3) education of crews about the necessity of taking drinks whose volume, regularly distributed over the day, is adapted to the climate. P.G.

A69-43389 #
HYPNOTICS AND JET-AGE TRAVEL.
J. Snyder (Hoffmann-La Roche, Inc., Nutley, N.J.).
IN: INTERNATIONAL CONGRESS OF AEROSPACE MEDICINE, 18TH, AMSTERDAM, NETHERLANDS, SEPTEMBER 15-18, 1969, FREE COMMUNICATIONS. (A69-43369 24-04)
The Hague, Inter Scientias, 1969, p. 279-284. 15 refs.

Study of the properties of some hypnotic compounds with regard to the suppression of the REM (rapid eye movements) stage. Of the eight hypnotics tested under sleep laboratory conditions only chloral hydrate and flurazepam have not suppressed the REM stage and only three, chloral hydrate, flurazepam, and secobarbital, have not led to a rebound on withdrawal. Of these only one, flurazepam, proved effective in reducing sleep latency. P.G.

A69-43390 #
NORMS FOR QUANTITATIVE VECTORCARDIOGRAPHY WITH SPECIAL EMPHASIS ON THE MEDICAL EVALUATION OF FLYING PERSONNEL.
P. Rijlant, I. Ruttkay, J. Cernohorsky, and A. Allard.
IN: INTERNATIONAL CONGRESS OF AEROSPACE MEDICINE, 18TH, AMSTERDAM, NETHERLANDS, SEPTEMBER 15-18, 1969, FREE COMMUNICATIONS. (A69-43369 24-04)
The Hague, Inter Scientias, 1969, p. 287-292. 9 refs.

Investigation of vectorcardiograms in order to distinguish a pathological change from a normal vectorcardiogram. A conventional statistical analysis was applied in this study. The typology of the initial and terminal phases, as well as of the maximal projection, has been studied by superposition techniques. From the results obtained on healthy young subjects (male and female, between the ages of 17 to 35) it is concluded that the use of classical statistical procedures for differentiating between norm and pathology is legitimate. P.G.

A69-43391 #
MEDICAL WASTAGE OF MILITARY AND CIVIL AIRCREW IN GREAT BRITAIN 1963-68.
G. Bennett (Board of Trade, London, England) and P. J. O'Connor (Royal Air Force, Farnborough, Hants., England).
IN: INTERNATIONAL CONGRESS OF AEROSPACE MEDICINE, 18TH, AMSTERDAM, NETHERLANDS, SEPTEMBER 15-18, 1969, FREE COMMUNICATIONS. (A69-43369 24-04)
The Hague, Inter Scientias, 1969, p. 299-305.

Comparison of the medical wastage of trained professional aviators in military and civil flying in Great Britain for the years 1963 to 1968. By the term medical wastage is meant those flight deck personnel who are prevented from validating their flying license by reason of ill health or death. The main causes of medical wastage are compared for different age categories: cardiovascular disease, fatal flying accidents, and psychiatric disease. Further causes of minor importance, such as neurological, metabolic, neoplastic, traumatic, respiratory, and gastrointestinal, are also considered. P.G.

A69-43392 #
PREVENTION OF FOOD-BORN DISEASES IN CIVIL AVIATION.
D. A. A. Mossel and J. Hoogendoorn.
IN: INTERNATIONAL CONGRESS OF AEROSPACE MEDICINE, 18TH, AMSTERDAM, NETHERLANDS, SEPTEMBER 15-18, 1969, FREE COMMUNICATIONS. (A69-43369 24-04)
The Hague, Inter Scientias, 1969, p. 309-313.

Demonstration of the need for continuous and increasing alertness with respect to food-hygiene in commercial aviation. Some cases of acute gastroenteritis which occurred during flight are reported. Preventive measures are summarized in the areas of purchasing, premises, personnel, processing, and plane-operations. The principles and practice to be observed under each of these headlines are discussed. Recommended methods of surveillance are reviewed. P.G.

A69-43393 #
UNSCHEDULED LANDINGS FOR MEDICAL REASONS—A FIVE-YEAR SURVEY OF THE EXPERIENCE AT AMERICAN AIRLINES.
Victor Schocken and Ludwig G. Lederer.
IN: INTERNATIONAL CONGRESS OF AEROSPACE MEDICINE, 18TH, AMSTERDAM, NETHERLANDS, SEPTEMBER 15-18, 1969, FREE COMMUNICATIONS. (A69-43369 24-04)
The Hague, Inter Scientias, 1969, p. 333-339.

Survey of aircraft landings made optionally at the discretion of the crew in order to deplane a passenger who for medical reasons could not continue on the scheduled destination of the flight. The costs and time consumption of such unscheduled landings are discussed, and means of avoiding them are suggested. The reported medical reasons for unscheduled landings at American Airlines in the years 1964 to 1968 are listed. P.G.

A69-43394 * #
A MINIATURIZED PUMP OXYGENATOR FOR EVALUATION OF PERIPHERAL CIRCULATORY CHANGES INDUCED BY LONGTERM WEIGHTLESSNESS IN RATS.
Vojin Popovic and Pava Popovic (Emory University, Medical School, Dept. of Physiology, Atlanta, Ga.).
IN: INTERNATIONAL CONGRESS OF AEROSPACE MEDICINE, 18TH, AMSTERDAM, NETHERLANDS, SEPTEMBER 15-18, 1969, FREE COMMUNICATIONS. (A69-43369 24-04)
The Hague, Inter Scientias, 1969, p. 357-360.
NASA-supported research.

Description of a cardiopulmonary bypass developed to study the effects of long-term weightlessness on the cardiovascular system of small laboratory animals such as mice, white rats, and squirrel monkeys. This device, a small membrane-type heart-lung machine,

was developed for use in assisted-circulation experiments. After cannulation of aorta and right ventricle with large polyethylene tubes the animals are connected to the pump oxygenator. It is noted that the extracorporal blood flow of rats during bypass is 70 to 80 per cent of the total cardiac output. The survival of animals (63 white rats) is reported to be 100 per cent for one hour bypass. P.G.

A69-43395 #
PSYCHIATRICAL AND PSYCHOLOGICAL APPROACH.
H. Gartmann.
IN: INTERNATIONAL CONGRESS OF AEROSPACE MEDICINE, 18TH, AMSTERDAM, NETHERLANDS, SEPTEMBER 15-18, 1969, FREE COMMUNICATIONS. (A69-43369 24-04)
The Hague, Inter Scientias, 1969, p. 401-407. 6 refs.

Description of the routine procedure of pilot selection with emphasis on the integration of an all-round personality picture out of as many and as different approaches as possible. It is stressed that discrepancies and unclarified findings should be a stimulus for the examiners to reconsider and reexamine the candidate. The psychiatric interview forming part of the examination is discussed, and the possibilities of misjudgments are considered. Some examples of actual cases are given to illustrate the necessity of a psychiatric evaluation of inexplicable test results. P.G.

A69-43396 * #
MEDICAL PROBLEMS IN SPACE.
Douglas E. Busby (Continental Air Lines, Inc., Los Angeles, Calif.).
IN: INTERNATIONAL CONGRESS OF AEROSPACE MEDICINE, 18TH, AMSTERDAM, NETHERLANDS, SEPTEMBER 15-18, 1969, FREE COMMUNICATIONS. (A69-43369 24-04)
The Hague, Inter Scientias, 1969, p. 411-418.
Contract No. NASr-115.

Outline of various possible medical problems to be encountered during spacecraft operations, and discussion of means to manage them. The study is oriented to interplanetary missions of long duration, with the facilities and medically trained personnel being available on spacecraft with large crews for the diagnosis and treatment of medical problems in space. Diagnostic techniques recommended for space conditions are listed and definitive and supportive therapeutic measures are proposed. Both the diagnostic techniques and the therapeutic measures are basically derived from medical methods used on earth with only minor adaptations. Types of drugs and intravenous fluids indicated in the management of medical problems in space are listed and discussed. It is noted that the main factors determining drug selection are single and multiple usefulness, specific actions, undesirable side-effects, number of modes of administration, shelf-life and stability, and absence of harmful effects peculiar to the space environment. It is stressed that the physician-astronaut should not only be specialized in aerospace medicine, but should also have an extensive general medical and surgical background. P.G.

A69-43397 #
BACTERIAL ACTIVITY IN LOW AMBIENTAL PRESSURE.
F. M. Merayo.
IN: INTERNATIONAL CONGRESS OF AEROSPACE MEDICINE, 18TH, AMSTERDAM, NETHERLANDS, SEPTEMBER 15-18, 1969, FREE COMMUNICATIONS. (A69-43369 24-04)
The Hague, Inter Scientias, 1969, p. 429-437. 20 refs.

Investigation of the survival rates and the morphology and sedimentation rates of the blood in two groups of 25 white mice kept for periods of seven or ten days in a pressure chamber at pressures of 305 or 120 mm Hg in 40 or 100 per cent oxygen media after injections of a *Klebsiella pneumoniae* suspension or a suspension of saprophite bacteria isolated from the throats of healthy humans. No conclusive results were obtained concerning the effect of low pressure on the resistance of the mice to these infections. The significance of this subject in space biology is indicated, and further studies of it are urged. V.Z.

A69-43398 #
FACTORS INFLUENCING THE TIME OF SAFE UNCONSCIOUSNESS (TSU) FOR COMMERCIAL JET PASSENGERS FOLLOWING CABIN DECOMPRESSION.
James G. Gaume (McDonnell Douglas Corp., Douglas Aircraft Co., Long Beach, Calif.).
IN: INTERNATIONAL CONGRESS OF AEROSPACE MEDICINE, 18TH, AMSTERDAM, NETHERLANDS, SEPTEMBER 15-18, 1969, FREE COMMUNICATIONS. (A69-43369 24-04)
The Hague, Inter Scientias, 1969, p. 447-457. 5 refs.

Analysis of the physical and physiological factors involved in determining a time of safe unconsciousness permissible for aircraft passengers after cabin decompression. As a result of this investigation, it is suggested that, in the event of an aircraft cabin decompression, the time the cabin is above 25,000 ft altitude be established as a quick-reference guide for pilots to determine the safety of passengers. A relatively safe time may be considered as 1 min and 40 sec to 2 min. The passengers may become unconscious due to other influential factors such as decompression rate, maximum cabin altitude, rate of descent, and final cruise altitude. G.R.

A69-43399 #
EVALUATION OF THE SKIAGRAM.
F. Rempt, J. Hoogerheide, and W. P. H. Hoogenboom (National Aeromedical Centre, Soesterberg, Netherlands).
IN: INTERNATIONAL CONGRESS OF AEROSPACE MEDICINE, 18TH, AMSTERDAM, NETHERLANDS, SEPTEMBER 15-18, 1969, FREE COMMUNICATIONS. (A69-43369 24-04)
The Hague, Inter Scientias, 1969, p. 461-464.

Evaluation of the results of retinoscopic measurements of the peripheral refraction of the eye in 442 pilots. The results of the measurements were recorded on diagrams termed skiagrams. The skiagrams were classified into five general types in terms of the amount of astigmatism. An attempt is made to establish a correlation between the different types of skiagrams and the central refraction. Possible applications of skiagrams are examined. T.M.

A69-43400 #
ACQUIRED MYOPIA IN YOUNG PILOTS.
J. Hoogerheide, F. Rempt, and W. P. H. Hoogenboom (National Aeromedical Centre, Soesterberg, Netherlands).
IN: INTERNATIONAL CONGRESS OF AEROSPACE MEDICINE, 18TH, AMSTERDAM, NETHERLANDS, SEPTEMBER 15-18, 1969, FREE COMMUNICATIONS. (A69-43369 24-04)
The Hague, Inter Scientias, 1969, p. 467-470.

Statistical study of the incidence of myopia in 226 commercial and 159 military pilots after the initiate medical examination. About 5 per cent of the initially hyperopic pilots later became myopic. Thirty per cent of the emmetropic pilots developed myopia. Attention is given to the value of the skiagram in prognosis. T.M.

A69-43401 #
LAMBDA WAVES IN EEG OF NORMAL ADULTS AND THEIR RELATION TO COMPLEXITY OF VISUAL IMAGERY.
D. N. J. Donker (National Aeromedical Centre, Soesterberg, Netherlands) and J. F. Smits (Utrecht, State University, University Hospital, Dept. of Electroneurology, Utrecht, Netherlands).
IN: INTERNATIONAL CONGRESS OF AEROSPACE MEDICINE, 18TH, AMSTERDAM, NETHERLANDS, SEPTEMBER 15-18, 1969,

FREE COMMUNICATIONS. (A69-43369 24-04)
The Hague, Inter Scientias, 1969, p. 473-478.

Consideration of the recording of lambda waves as a useful means of evaluating eye movements during pattern vision. Such evaluation is important when studying visual function in flying personnel. For this reason investigations in addition to those carried out previously, concerning relations between visual stimuli and the occurrence of lambda waves, were undertaken. As a first step, the investigations were carried out under routine EEG recording conditions. Five pictures were presented to 92 subjects aged between 19 and 45 years. In all cases lambda waves occurred during the presentation of the pictures. The duration and number of the lambda waves were not influenced by the nature of the pictures presented. The amplitudes of the waves, however, were influenced considerably by the nature of the pictures. F.R.L.

A69-43402 #
BASIC STUDIES ON HIRUDO MEDICINALIS FOR A SPACE EXPERIMENT. I.
Robert G. A. Lotz, Manfred E. A. Fuchs, and Peter E. A. Moyat (Frankfurt, Universität, Forschungsgruppe für extraterrestrische Biologie, Frankfurt am Main, West Germany).
IN: INTERNATIONAL CONGRESS OF AEROSPACE MEDICINE, 18TH, AMSTERDAM, NETHERLANDS, SEPTEMBER 15-18, 1969, FREE COMMUNICATIONS. (A69-43369 24-04)
The Hague, Inter Scientias, 1969, p. 491-498. 9 refs.

Description of experiments conducted to determine the behavioral patterns and the physiological parameters of the medical leech *Hirudo medicinalis* in a natural environment prior to a biological space experiment. The oxygen uptake of the leech is examined as a function of size, state of nutrition, and activity of the animal. Apparatus designed to study the diurnal rhythm of the leech is described, and the results of completed experiments indicate that there is a diurnal rhythm associated with a periodic change in light. Experiments conducted to establish techniques for killing micro-organisms present on the skin and released from the internal organs of the leech are outlined. T.M.

A69-43403 #
BASIC STUDIES ON HIRUDO MEDICINALIS FOR A SPACE EXPERIMENT. II.
Robert G. A. Lotz and Gary H. Bowman (Frankfurt, Universität, Forschungsgruppe für extraterrestrische Biologie, Frankfurt am Main, West Germany).
IN: INTERNATIONAL CONGRESS OF AEROSPACE MEDICINE, 18TH, AMSTERDAM, NETHERLANDS, SEPTEMBER 15-18, 1969, FREE COMMUNICATIONS. (A69-43369 24-04)
The Hague, Inter Scientias, 1969, p. 501-507.

Investigation of the influence of various stresses on the medical leech in order to study its suitability for space experiments. It has been found that the leech can survive in a 100 per cent relative humidity at 15 to 25 deg C for several months. From experiments with varying pressure the conclusion is drawn that leeches can survive at an oxygen pressure of 150 mm Hg. High carbon dioxide contents do not strongly affect leeches, but leeches subjected to calcium hydroxide concentrations of about 0.1 per cent in water die within two hours. Leeches have been subjected to vibrations, accelerations, and mechanical shocks at levels anticipated for spacecraft or higher. No change in the normal behavior of the leeches was observed except for a period of apparent excitement during and shortly after each test. From the results obtained it is concluded that *Hirudo medicinalis* can tolerate the rigors of the launch, orbit, and reentry without degradation and serious compromise to the experiment. P.G.

A69-43404 #
THE URINARY EXCRETION OF HORMONAL METABOLITES BEFORE, DURING AND AFTER INTERCONTINENTAL FLIGHTS.
Th. Strengers (O. L. Vr. Gasthuis, Clinical Chemical Dept., Amsterdam, Netherlands).
IN: INTERNATIONAL CONGRESS OF AEROSPACE MEDICINE, 18TH, AMSTERDAM, NETHERLANDS, SEPTEMBER 15-18, 1969, FREE COMMUNICATIONS. (A69-43369 24-04)
The Hague, Inter Scientias, 1969, p. 511-514. 5 refs.

Evaluation of the results of a recent study in which a differentiation of the steroids excreted was made in hourly samples of urine from test subjects flown from Amsterdam to Anchorage and back after a two-week stay. A gas-chromatographic procedure proposed by Van Kampen and Hoek (1967, 1968) was used in the steroid identification. The possible causes of the disturbances in steroid metabolism established in the test subjects are discussed. V.Z.

A69-43405 #
SELECTIVE G-FORCE APPLICATION IN THE TREATMENT OF RETINAL DETACHMENT.
J. ten Doesschate, R. Hoppenbrouwers, and M. P. Lansberg (National Aeromedical Centre, Soesterberg, Netherlands).
IN: INTERNATIONAL CONGRESS OF AEROSPACE MEDICINE, 18TH, AMSTERDAM, NETHERLANDS, SEPTEMBER 15-18, 1969, FREE COMMUNICATIONS. (A69-43369 24-04)
The Hague, Inter Scientias, 1969, p. 521-525.

Review of eight cases of retinal detachment treated with centrifugation. The principle of selective loading is introduced with minimal load on the circulation and optimal load on the retina. The result of centrifugation was good in only two cases. Unfortunately, in one of these a redetachment occurred during surgery. G.R.

A69-43406 #
THE RELATIONSHIP BETWEEN SOME PHYSIOLOGICAL AND PSYCHOLOGICAL VARIABLES.
L. Pannekoek and L. K. F. Njio.
IN: INTERNATIONAL CONGRESS OF AEROSPACE MEDICINE, 18TH, AMSTERDAM, NETHERLANDS, SEPTEMBER 15-18, 1969, FREE COMMUNICATIONS. (A69-43369 24-04)
The Hague, Inter Scientias, 1969, p. 529-531.

Description of the results of a research project undertaken to obtain acceptable measures of mental fitness in a group of 172 candidate pilots. From all the data collected, 17 common variables were chosen. Three variables are measures of the auditory transmission capacity, twelve variables are well-known physiological measures, and the remaining variables are age and educational level. Cross-correlations between these variables are demonstrated. T.M.

A69-43407 #
CIRCADIAN RHYTHM AND PERFORMANCE.
M. v. Zoeren, J. H. H. Thijssen, and L. Pannekoek (National Aeromedical Centre, Soesterberg, Netherlands).
IN: INTERNATIONAL CONGRESS OF AEROSPACE MEDICINE, 18TH, AMSTERDAM, NETHERLANDS, SEPTEMBER 15-18, 1969, FREE COMMUNICATIONS. (A69-43369 24-04)
The Hague, Inter Scientias, 1969, p. 535-539.

Study of measurable psychophysiological effects of fatigue and their possible correlation with somatic parameters which closely follow the circadian rhythm. Psychophysiological tests and cortisol determinations were performed at four-hour intervals in a 32-hour experiment with nine test subjects. A fluctuation in time was found both for the stipple test and for the cortisol content of the plasma. A negative correlation is exhibited between the degree of irregularity with which the stipple test was performed and the cortisol level in the plasma. T.M.

A69-43408 #
PECULIARITIES OF THE RESPONSE OF THE ACOUSTIC ANALYZER OF MAN DURING PROLONGED NOISE EFFECT IN A YEAR-LONG MEDICO-ENGINEERING EXPERIMENT.
T. N. Krupina, E. I. Mantsev, V. Ya. Levanov, M. A. Vytchikova, and I. Ya. Yakovleva.
IN: INTERNATIONAL CONGRESS OF AEROSPACE MEDICINE, 18TH, AMSTERDAM, NETHERLANDS, SEPTEMBER 15-18, 1969, FREE COMMUNICATIONS. (A69-43369 24-04)
The Hague, Inter Scientias, 1969, p. 547-549.

Description of the results of a year-long experiment in which three subjects were subjected to noise of varying pitch and intensity to determine the long-term effects on the acoustic analysor. Parameters evaluated at 14-day intervals included: (1) hearing thresholds for air and bone conduction of sound at frequencies from 125 to 8000 Hz, (2) differential thresholds of sound intensity and sound frequency, and (3) speech audiometry. Noise levels varied from 87 to 96 dB. The results demonstrate that humans can retain good hearing during a year-long exposure to continuous noise effects. T.M.

A69-43409 #
HAEMODYNAMIC AND BIOELECTRIC DISTURBANCES IN STRIATED MUSCLES OF RATS SUBJECTED TO ASSOCIATED INFLUENCE OF ACCELERATION FORCES AND HYPOKINESIA.
Barański Stanislaw, Edelwejn Zbigniew, and Wojtkowiak Mieczyslaw (Wojskowy Instytut Medycyny Lotniczej, Warsaw, Poland).
International Congress of Aerospace Medicine, 18th, Amsterdam, Netherlands, Sept. 15-18, 1969, Paper. 3 p.

Radioisotopic study of the hemodynamic and bioelectric disturbances in striated muscles of rats subjected to the combined action of acceleration forces and hypokinesia as part of an investigation of the physiological aspects of long-term space flights. Before the tests, the animals were administered albumin containing iodine 131. After the tests, specimens of leg muscle were subjected to a radioactivity determination. It is concluded that prolonged immobilization impairs the bioelectric activity of striated muscles and decreases the resistance of the neuromuscular system to acceleration forces. Z.W.

A69-43410 #
EFFECTS OF HYPERVENTILATION ON FLIGHT PERSONNEL (L'HYPERVENTILATION DANS LE PERSONNEL NAVIGANT).
R. Pannier, G. Leguay, A. Didier, and A. Sarrazin (Ministère des Armées, Hôpital des Armées D. Larrey, Versailles, France).
International Congress of Aerospace Medicine, 18th, Amsterdam, Netherlands, Sept. 15-18, 1969, Paper. 16 p. In French.

Study of hyperventilation (i.e., inappropriate, excessive ventilation) based on 12 clinical observations of this syndrome in flight personnel and of its adverse effect upon the human organism. It was found that, while the oxygen partial pressure in the arterial blood is modified only slightly and inconsequentially, the carbon dioxide partial pressure and the alkaline reserve are reduced and the blood pH is increased. This alkalosis is accompanied by a certain number of modifications of the blood and urine composition and of the functioning of various organs, leading to an enhanced nervous and muscular excitability. The hyperventilation syndrome is expressed by several symptoms, the most prominent of which are paresthesia and contraction of extremities (tetany). The different clinical signs of hyperventilation, including spasmophilia, and the clinical treatment of hyperventilation are described in detail. O.H.

A69-43411 #
GASEXCHANGE AT LOW AMBIENT PRESSURE.
M. E. Sluijter.
International Congress of Aerospace Medicine, 18th, Amsterdam, Netherlands, Sept. 15-18, 1969, Paper. 4 p.

Consideration of the factors involved in estimating the pressure safety limits in aircraft passenger cabins. The mechanism of the respiratory gas exchange in the human organism is outlined. The effect of a pressure drop on this mechanism is discussed. Also discussed are smoking as a factor aggravating the breathing conditions, and the breathing conditions of a passenger with mild respiratory obstructive disease. The lower limit of safety is put at 575 mm Hg ambient pressure. V.Z.

A69-43412 #
DECOMPRESSION SICKNESS IN AVIATION.
J. Ernsting (Royal Air Force, Institute of Aviation Medicine, Farnborough, Hants., England).
International Congress of Aerospace Medicine, 18th, Amsterdam, Netherlands, Sept. 15-18, 1969, Paper. 11 p. 20 refs.

Description of the clinical picture of decompression sickness arising as a result of exposure to altitude, with a brief discussion of the physiological mechanisms underlying this syndrome and a summary of the current treatment of the condition. The basic mechanism responsible for the production of altitude decompression sickness is the supersaturation of the tissues with nitrogen, since the syndrome does not occur if nitrogen is removed from the body by breathing 100 percent oxygen before ascent to altitude. The primary treatment of decompression sickness arising at altitude is recompression to ground level as rapidly as possible. The primary method of avoiding the occurrence of decompression sickness is to limit the reduction of environmental pressure to which crew and passengers are exposed during flight. F.R.L.

A69-43414 #
DECOMPRESSION DISEASE.
I. Boerema (Amsterdam, University, Surgical Dept., Amsterdam, Netherlands).
International Congress of Aerospace Medicine, 18th, Amsterdam, Netherlands, Sept. 15-18, 1969, Paper. 7 p.

Examination of the symptoms of decompression disease from the standpoint of the formation of gas bubbles in the blood vessels. The role of oxygen in decompression disease is briefly discussed. Special attention is given to the problem of air bubble formation as a principal cause of decompression disease. The physiological effects of air bubbles on the venous system, lungs, and precapillaries are examined. Cumulative damage in the lung vessels in fliers making several ascents during the same day is discussed. Factors preventing the occurrence of air metabolism during decompression are examined. Z.W.

A69-43514 *
LIMITATIONS ON PREBIOLOGICAL SYNTHESIS.
H. R. Hulett (Stanford University, Genetics Dept., Stanford, Calif.).
Journal of Theoretical Biology, vol. 24, 1969, p. 56-72. 35 refs.
Grant No. NGR-05-020-004.

Study of relationships between rates of synthesis and degradation for the energy levels available in the primitive environment presented by the earth at the beginning of life. These relationships are considered for such first-stage intermediates as hydrogen cyanide, formaldehyde, and organic phosphates. Energy sources in the terrestrial environment available for chemical evolution are considered. It is found that the photochemical buildup of sufficient quantities of the intermediates to permit further chemical evolution would have been difficult. Electrical discharges, sonic cavitation, and ionizing radiation are discussed. As a result of the investigations, a very low probability for the processes leading to the origin of life is found. G.R.

A69-43565 *
EFFECTS OF HYPEROXIA AND HYPOXIA ON MITOSIS IN THE

NORMAL AND REGENERATING RAT LIVER.

K. S. Talarico, D. D. Feller, and E. D. Neville (NASA, Ames Research Center, Environmental Biology Div., Moffett Field, Calif.).

Society for Experimental Biology and Medicine, Proceedings, vol. 131, 1969, p. 430-434. 9 refs.

Demonstration of the effects of hyperoxia and hypoxia on mitotic activity in the regenerating and normal rat liver by exposing partially hepatectomized and unoperated rats to hyperoxic and normobaric, hyperoxic and hypobaric, normoxic and hypobaric, and hypoxic and hypobaric environments. When exposed to 100 per cent oxygen at various pressures for various time periods up to 34 hr, no change was noted in the animals. When exposed to a hypoxic condition (air, 380 mm Hg) for the same time periods, the partially hepatectomized group showed a delay in the initiation of mitosis, while the unoperated group showed a reduction in mitotic activity due to the hypoxic environment. F.R.L.

A69-43705 #

NEW MEASUREMENT TECHNIQUES IN THE INVESTIGATION OF THE INFLUENCE OF MICROWAVE FIELDS ON BIOLOGICAL OBJECTS (O NOVYKH METODAKH IZMERENII PRI ISSLEDOVANII VLIIANIIA POLEI SVCh-DIAPAZONA NA BIOLOGICHESKIE OB'EKTY).

V. M. Kolesnikov (Leningradskii Institut Tochnoi Mekhaniki i Optiki, Leningrad, USSR).

Priborostroenie, vol. 12, no. 7, 1969, p. 9-12. 5 refs. In Russian.

Development of a method based on the use of dielectric waveguides for studying the influence of electromagnetic microwave fields on body tissue. The method proposed is also suitable for determining the electromagnetic energy imparted to an entire biological sample regardless of its composition and configuration. Results obtained in studying the modes of operation of dielectric waveguides under various biological loads or when coated with thin layers of biological material are presented. V.P.

A69-43750 *

SYNTHESIS OF ACYCLIC ISOPRENOIDS BY THE γ-IRRADIATION OF ISOPRENE.

Colin Munday, Katherine Pering, and Cyril Ponnamperuma (NASA, Ames Research Center, Exobiology Div., Moffett Field, Calif.).

Nature, vol. 223, Aug. 23, 1969, p. 867, 868. 18 refs.

Discussion of experiments in which it was shown that branched chain acyclic polymers can be produced from isoprene under plausible geochemical conditions. Two series of experiments were conducted. In the first, isoprene was irradiated by cobalt 60 gamma rays in sealed tubes. In the second, isoprene was adsorbed onto the surface of vermiculite before irradiation. The products were then extracted from the vermiculite with 10 ml of freshly distilled isoprene. Excess solvent was removed under vacuum. A portion of the products of each series was hydrogenated in hexane at atmospheric pressure, using hydrogen with 5 per cent palladium as a catalyst. The products before and after hydrogenation were analyzed by gas chromatography and mass spectrometry. Parallel studies of the isoprene and the vermiculate before irradiation showed that they were free of the compounds sought. V.P.

A69-43798

MEASUREMENTS OF PRESSURE-WAVE TRANSMISSION IN LIQUID-FILLED TUBES USED FOR INTRAVASCULAR BLOOD-PRESSURE RECORDING.

K. E. Latimer and R. D. Latimer (Middlesex Hospital, Dept. of Clinical Measurement, London, England).

Medical and Biological Engineering, vol. 7, Mar. 1969, p. 143-168. 27 refs.

Description of a transmission testing technique for measuring some of the characteristics of a liquid-filled tube at subaudio and audio frequencies, using equipment readily available in teaching hospitals. Pressure ratios and phase readings are obtained from Lissanjous figures displayed on an oscilloscope. The attenuation and phase constants of the tube are determined by simple calculations from these readings. It is noted that it is possible to deduce practically all the information required for engineering purposes, including an approximate analysis of the various losses of the tube and the determination of the characteristic impedances, as a complex function of frequency. It is concluded that the method may prove a useful tool for research in the physical properties of plastics and that adaptations of the same test rig may may find applications in the routine maintenance of hospital apparatus and in hemodynamics. P.G.

A69-43799

OXYGEN AND CARBON DIOXIDE TRANSFER IN MEMBRANE OXYGENATORS.

M. H. Weissman and L. F. Mockros (Northwestern University, Technological Institute, Evanston, Ill.).

Medical and Biological Engineering, vol. 7, Mar. 1969, p. 169-184. 19 refs.

NIH Grants No. HE-09536; No. FR-00018; No. GM-19418.

Investigation of blood oxygenation in units whose membranes are round tubes with gas-transmitting walls. It is shown that gas transfer in membrane oxygenators can be limited by liquid dispersion or the membrane diffusion. If limited by liquid dispersion, the increase in average oxygen saturation of blood flowing in straight gas-permeable tubes is dependent upon the flow rate, the tube length, and the diffusion coefficient, and is independent of the tube diameter. A mathematical solution is given. The assumption utilized in the model and the analytic solution were verified by a series of experiments using cattle blood. Tube staging, turbulence, and tube coiling bring about mixing and significantly improve the oxygenation rate. It is noted that in the case of coiled tubes the oxygenation efficiency depends on the Reynolds number, the Schmidt number, and the tightness of the coil. A limit on the rate of oxygen addition and carbon dioxide removal might be imposed, for thick-walled tubes, by diffusion through the tube wall. It is found that the wall-limited case is governed by carbon dioxide removal. P.G.

A69-43800

FREQUENCY ANALYSIS OF HEART MURMURS.

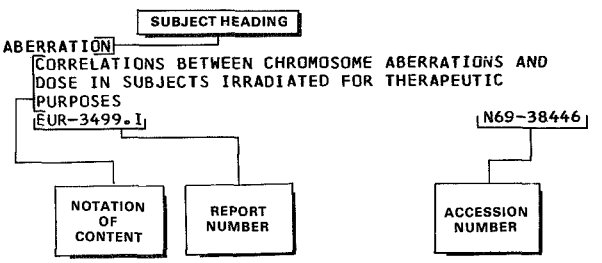
E. Van Vollenhoven, A. Van Rotterdam, T. Dorenbos (Centrale Organisatie TNO, Medisch-Fysisch Instituut, Utrecht, Netherlands), and F. G. Schlesinger (University Hospital, Cardiology Dept., Utrecht, Netherlands).

Medical and Biological Engineering, vol. 7, Mar. 1969, p. 227-232. 5 refs.

Frequency analysis of heart murmurs was performed on 30 patients. The object of the work was to improve the detection of aortic insufficiency in the presence of mitral stenosis; this is of importance when cardiac surgery with heart lung machines is contemplated. The technical details of the method developed are described. (Author)

Subject Index

Typical Subject Index Listing



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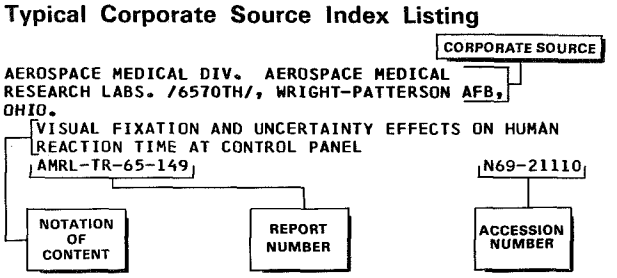

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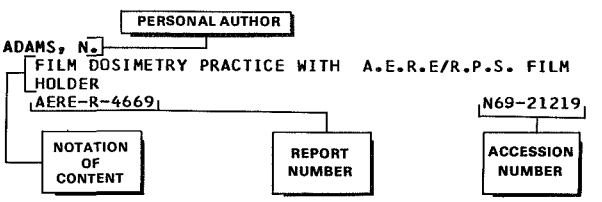

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